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THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—9TH YEAR. SYDNEY: SATURDAY, MAY 13, 1922. No. 19.

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THE IMPORTANCE OF THE UTERO-SACRAL LIGAMENTS IN UTERINE PROLAPSE.[1]

BY C. A. THELANDER, M.B., CH.B. (EDIN.),
Brisbane.

PROLAPSE of the uterus means its descent along the vaginal canal. In most of the cases clinically observed it is merely an incident in a wide-spread pelvic catastrophe for which the gynæcologist thanks the obstetrician's ambition to improve on Nature's methods and for which the patient and her friends usually spread far and wide the renown of the obstetrician who snatched her from the jaws of death into which he had first delivered her. Among the attendant ailments of other pelvic viscera it is often difficult to distinguish the features of uterine prolapse. It is therefore better to take into consideration those cases in which obstetric assistance has not been rendered. I have observed prolapse in nulliparæ of various ages, the youngest being eighteen years.

Prolapse of the Uterus.

In such cases there is a descent of the uterus into the vagina, with a telescoping of the vaginal walls. The process resembles an intussusception. The anterior vaginal wall first becomes shortened and the transverse rugæ more marked till the median column is often lost to view. As the descent proceeds, the shortening of the anterior wall ceases effectively to take up the slack and the intussusception is observed in the form of sagging of the bladder into the vagina. This may form a well-marked cystocele and present at the orifice before the uterus or it may follow the uterus. There is no deepening of the anterior fornix in this process. If it is of slow progress, there may be great elongation of the cervix, but the continuity of the uterine muscle with the longitudinal vaginal muscle tissue of the anterior and lateral walls is so strong that the relative positions of uterus and anterior vaginal wall remain undisturbed.

The movement in the posterior fornix is different. It deepens and closely simulates intussusception. It does not travel down in advance of the uterus, but is drawn down by its attachment thereto. The lower half of the posterior wall is strongly supported by the *levator ani* muscles and will be found entirely undisturbed, even when the cervix is emerging from the vaginal orifice. Rectocele does not occur without gross trauma.

In the later stages of prolapse the uterus must be in a position of retroversion; this may or may not be its position at the beginning.

With the trunk in the erect position the weight

[1] Read at a meeting of the Queensland Branch of the British Medical Association on March 3, 1922.

of intra-abdominal pressure is borne by the *levator ani* muscle group and by the pelvic fasciæ. These form a diaphragm quite strong enough for the purpose if it were not for the breaches in its continuity. The point of weakness we have to consider is the breach made by the vaginal canal. As long as this canal is kept in its normal position, the effect of intra-pelvic pressure is to close it by pressing the anterior and posterior walls together. The orifice is well guarded by its sphincter muscles, which, like the other members of the *levator ani* group, are well adapted to resist voluntary increases of intra-pelvic pressure, as long as the pressure is not exerted from within the vaginal canal. If the position of the vagina were maintained, prolapse of the uterus would not be as frequent as is prolapse of the rectum in the male.

The action of the *levator ani* muscles on the vagina is in an upward and forward direction. It affords intimate support to the lower half of the posterior wall and only indirect support to the remainder of the vagina and to the uterus. The presence and integrity of these muscles are scarcely relevant to uncomplicated prolapse. In my limited experience, I have seen three cases of complete perineal laceration, of twelve, twenty and thirty-five years' duration, quite unattended by prolapse and many cases of prolapse of varying degree in nulliparous women. The determining factor is the validity of the structures which support the vault of the vagina. Of these structures I believe the most important to be the utero-sacral ligaments. I believe a thorough study of the morbid anatomy of this condition of prolapse in various stages would demonstrate this beyond doubt; but we have unfortunately no opportunity for such work in Brisbane. The only evidence I can put before you is such as can be gleaned from observations of the clinical pathology of prolapse, inquiry into its causation and noting the results of treatment.

The Uterine Supports.

The special supports of the uterus and thereby of the vaginal vault are its ligaments: three pairs, the round, the broad or lateral and the posterior or utero-sacral. We may judge the influence of these structures on opening a normal abdomen, if we remember to allow for the difference between vertical and horizontal posture.

I have never seen any indication that the round ligaments contribute to the support of the uterus. When they are picked up their lack of tension is always a notable feature and if in their normal position they contract, the only effect exercised on the womb will be to secure its anteversion. Even this effect applies only to the fundus and is not inconsistent with the first movement of prolapse. These ligaments are much enlarged in pregnancy and I think that whatever physiological action they have is chiefly relative to that condition. From the multiplicity of surgical procedures in which they are involved, it would appear that they subserve another purpose. They offer a fairly safe region for the exercise of surgical ingenuity and enterprise.

The lateral and the posterior ligaments are practically one structure, of which two portions are somewhat specialized, forming definite fibro-muscular bands amid somewhat indefinite fibrous tissue. The utero-sacral ligaments have long been recognized as very definite bands, almost as substantial as the round ligaments and containing a large proportion of muscle continuous with that of the womb. From its attachment to the posterior and lateral surfaces of the uterus at the level of the internal *os uteri* each ligament sweeps outwards, backwards and upwards, spreading fan-wise to its attachment by strong fibrous tissue to the sacro-iliac articulation at the level of the second and third sacral vertebræ. The broad ligament contains a fairly definite fibro-muscular band, which extends almost horizontally outwards from a diffuse origin from the lower uterine segment, cervix and vagina to a similar insertion in the parietal pelvic fascia. It has been carefully described by A. J. Nyulasy, of Perth, who names it the cardinal ligament, as suggested by Kochs.

From their position it must be inferred that the cardinal ligaments act in opposition and tend to steady the uterus in its normal position. But in order effectively to resist the intra-abdominal downward pressure, they would require to be very powerful, for the resultant upward pull of two almost horizontal ligaments is very small. If they remain intact their upward pull becomes greater the lower the uterus descends, for the angle at which they act becomes less obtuse. But they have very little resistance to offer to the first movement of prolapse, which is downward and forward in the direction of the vaginal canal. It is this first movement which determines the existence or otherwise of prolapse and, very often, as in other deformities (*e.g.*, flat foot) this stage, if progressive, gives as much pain as the fully established malady.

Now the resultant force exerted by the utero-sacral ligaments is directly in the line of the vaginal canal. Tension of these two bands causes tension of the longitudinal bands of the anterior vaginal wall, which have been termed the pillars of the bladder, and relaxation of the utero-sacrals is associated with shortening and corrugation of the anterior vaginal wall.

In a normal abdomen, if you grasp the lower uterine segment between thumb and finger, you will find that it can be moved laterally with little resistance till it almost touches the wall of the pelvis on either side. Even a vaginal examination will verify this. There is no band of tissue that stands out very strongly against this movement, but there is quite sufficient force to bring the uterus back to the middle line at once when the traction ceases. If, however, you try to thrust the lower segment downwards and forwards, you will find the utero-sacral ligaments stand out plainly at once and to the feel they are very strong and definite. They will not allow you in the normal condition to approximate the front of the uterus any closer than two finger's width from the back of the pubis without undue tension. If there is prolapse, even of slight degree, and especially if the associated cystocele is well marked, you can bring the front of the uterus into contact with the pubis and even then

the utero-sacral ligaments may be very little in evidence. Closer examination will show that the uterine ends of the ligaments are intact; the defection has taken place in the intermediate or parietal portions, usually at the parietal end of the intermediate third.

It is interesting to consider how little we know, except by deduction and conjecture, of the causes of prolapse. Nevertheless, there is a gradual hardening of opinions, based on clinical evidence, which may be accepted as knowledge.

The association of prolapse with obstetric difficulty is very common. Here the obstetrician is undoubtedly often at fault through his acceptance of current doctrine. He holds that when he has delivered by the high forceps operation with little delay in order to catch a train or to attend a party, if he repairs efficiently the perineal laceration he has made, any prolapse that may occur subsequently is to be regarded as the will of God. He does not realize that if he has not started the prolapse, a defective perineum will not cause it, till the next pregnancy, at all events. The obstetric damage which causes prolapse, is rupture or over-strain of the ligaments of the womb, by dragging the womb down with the child. This must be entered as a debit against the axis-traction forceps. The ligament which is certain to sustain most damage in this way, is the utero-sacral. The broad ligaments are not pulled so far beyond their normal excursion. I have known one instance of prolapse after labour in which the only way to account for it was the great violence with which the nurse had expressed the placenta. It was a natural labour and the perineum was quite intact. Here again is a trauma which must affect especially the utero-sacral ligaments.

In nulliparæ the most potent causes are those which act during adolescence: sedentary occupations, with their associated constitutional debility. The schoolgirl who sits at her work, is almost certain to suffer periodically from over-distension of the bladder; for that matter, so are all who sit at their work. The weight of this burden is supported by the pillars of the bladder, which are in turn kept tense by the utero-sacral ligaments. This it is, and not the accompanying retroversion, which begins the prolapse. The weight of the uterus is so slight that retroversion will not cause prolapse, unless the fundus becomes anchored to the pouch of Douglas, probably through infection, in which case a partial prolapse is very likely to occur.

Restoration of Utero-Sacral Ligaments.

From the foregoing observations and arguments I was led to the conclusion that a restoration of the utero-sacral ligaments would be in theory an ideal method of correction of prolapse and I have put it to test in twenty-one patients since 1919. The first method I used was plication of the ligaments, by a technique almost identical with that of J. van D. Young, of New York, who has been writing up the subject since 1903. I have varied the technique in the endeavour to avoid difficulties in certain cases and while the operation is not exempt from failures, sufficient success has been achieved to justify it and to demand its recognition by teachers of gynæcology.

It may be objected that this operation is not necessary; there are already sufficient methods of dealing with prolapse. In this matter it may be as well to consider the patient's point of view. The number of women who come complaining of prolapse, is not very great nowadays; of those who do so, many are suffering from the associated cystocele rather than the prolapse. The complaint is of some symptom which can only be explained by reference to the displacement discovered on examination. Backache, vertical headache, a "sinking feeling" and "bearing down," especially when tired, and frequency of urination are about the commonest complaints. Sometimes it is dysmenorrhœa; frequently it is sterility, with the statement volunteered that the vagina ejects its contents immediately after coitus. The loss of desire and other nervous disorders frequently engage the mental efforts of the psycho-analyst, while an associated bacilluria induces the physician to advise against operation. It is by the relief of symptoms that the patient measures the success of treatment and it must be admitted that by this standard much of our pelvic surgery yields only a limited measure of success. It is an ungrateful task to enumerate other men's failures and not very wise to enlarge upon one's own. But the number and variety of surgical procedures will be sufficient to prove the operators' dissatisfaction with any one method.

Seeking for the logical connexion between prolapse and its symptoms I find it hard to attribute to the position of the fundus any of the symptoms, excepting, perhaps, dysmenorrhœa. Ruling out the cases in which there are other pelvic complications and the picture is not clear, my observation has been that it is the displacement of the lower uterine segment and of the vaginal vault which seem to have the most direct bearing upon the symptoms. When it is considered that none of the older methods of intra-pelvic operation for prolapse exercise any support to the uterus except by the fundus and that none of them can restore the relations of the uterus to the sacrum, it would appear that here is a likely explanation of their variable results.

Having decided that the restoration of these ligaments seems a desirable and natural method of treatment for prolapse, the question of technique arises. The patient is always entitled to the simplest that will answer the purpose; the surgeon must always be on his guard lest his fondness for his new accomplishment distort his judgement. It is a little humiliating to find our up-to-date investigations leading right back to the ancients, but I have to state that in suitable cases the simplest method available is the use of the Hodge pessary. In nulliparæ and in parous women where the ligaments are not actually torn a Hodge pessary for six months will often effect a cure. It acts by taking the tension off the ligaments, thereby giving the muscular tissue contained therein time to contract, to take up the slack and to return to normal dimensions. I have found this successful in many cases;

the most striking was that of a nullipara of about fifty, who had put on weight rapidly at her menopause and whose *os uteri* presented at the vulva. It is difficult to apply in the case of virgins and operative treatment is often preferred. In parous women it is very often worth a trial if the prolapse is not an immediate consequence of the labour. I am satisfied that if in cases of doubt the mother is given a pessary as she leaves the nursing home, with instructions to report in a month or two, subsequent prolapse would often be avoided.

In nulliparæ of sedentary occupation it is often said that the symptoms do not trouble during holidays. By taking this hint and advising a change of occupation, with a little postural treatment if thought necessary, the unphysiological juggling with the round ligaments which is so popular to-day, will often be avoided. A little education of the patient in matters of physical hygiene may be all that is required if the prolapse be detected early enough. I know of a good many that have been cured in this way. It is more important to avoid overloading the bladder than the rectum, although neither organ may be neglected.

The surgeon must live, however, and many of these patients must help to provide the needful. No surgeon need ever be at a loss for a method of procedure; their name is legion. I am not prepared to condemn publicly any method, however little I may respect it, for there is always some indication for its use. What I have endeavoured to point out is that restoration of the utero-sacral ligaments is the only operation which replaces the uterus in its normal position by normal structures. Restoration or looping of the cardinal ligaments will not do it; Dr. Nyulasy recognizes the necessity of curtailing the utero-sacrals. If, on the other hand, the utero-sacrals are restored, the tension is taken off the lateral ligaments and during the patient's rest in bed these will probably be sufficiently restored.

Now, the methods available are re-attachment of the uterine end, plication of the intermediate portion and re-attachment of the parietal end of the ligament. Of these, uterine re-attachment has never seemed to me necessary. The intermediate portion of the ligament often gives way and may be repaired by plication. This operation has been very well worked out and described by Young. I was using a similar technique, but more primitive, before I read a report of his last paper on the subject. I find that he had worked up the subject long before I graduated and yet the first text-book acknowledgement of his contribution appears to be in the Oxford "Surgery." In *Surgery, Gynecology and Obstetrics* for September, 1919, you will find his method well described.

In cases where the defection of the ligament appeared to be rather at its parietal end, I have tried the effect of anchoring it to the pelvic fascia. This is easiest of access over the psoas muscle, between the external and internal iliac vessels. When there is a *psoas parvus*, its tendon may be used for the fixation of the ligament. Neither of these procedures are physiological, but the immediate result as regards position of the uterus has been good. One of the patients treated by this method developed œdema of the leg a few days after she left her bed, presumably from some obstruction of one of the iliac veins; it took about two months to clear up. Three others were found unsatisfactory at from two to twelve months after operation. Of these, one is a very fat women; one had pelvic adhesions at the time of operation and did not look promising at the time and the third had a miscarriage subsequently, which undoubtedly aggravated the relative failure. My impression is, however, that this method is not good.

Of the simple plications, I can find records of twelve; in some, no other procedure was employed; in a good many a round ligament suspension was added. The first patient was operated on in August, 1919, and has not reported since leaving hospital. The results are tabulated below.

Summary.

1. Prolapse of the uterus is more opposed by the utero-sacral ligaments than by any other structure.
2. Restoration of these ligaments approximates closer to a physiological condition than any other operation for prolapse.
3. It has been shown that after restoration of these ligaments the stress of normal labour may be withstood without recurrence of prolapse.
4. Plication of the ligament gives better results than parietal re-attachment.
5. The operation can easily be supplemented by one of the round ligament suspensions, if thought necessary.
6. Where utero-sacral support is adequate, no other operation is necessary.

Results Obtained.

PATIENT I.—J., aged twenty-seven years, married, was subjected to the Alexandar-Adams operation and utero-sacral plication on August 15, 1919. No subsequent report was received.

PATIENT II.—H., aged thirty-nine years, married, multipara, was treated by means of Gilliam's operation and utero-sacral plication on February 6, 1920. The latter part of the operation was not satisfactory on account of numerous adhesions. On March 4, 1920, the position of the uterus was satisfactory. On January 1, 1921, the position of the *fundus uteri* was good, but the patient complained that the pain in the back had recurred.

PATIENT III.—S., aged twenty-three years, married, no children, complained of severe dysmenorrhœa, with pain on the first day, chiefly on the left side. There was a well-developed prolapse of the uterus. On February 13, 1920, the cervix was dilated, the uterus curetted and utero-sacral plication performed. Nothing abnormal was discovered in the ovaries or the tubes. In April the patient reported that the pain was unaltered. The position of the uterus was good. In September the pain was rather less, but the condition was still not satisfactory. The position of the uterus was good. She left the town later and no further report has been received from her.

PATIENT IV.—W., aged thirty-two years, married, multipara, complained of frequency of urination and menstrual irregularity. She had a cystocele. The perineum was lax, but not torn. The cervix was dilated and curettage and utero-sacral plication were carried out on March 12, 1920. On June 25, 1920, she reported that she was feeling well. The position of the uterus was normal. On August 19, 1921, she was feeling well. There was no cystocele; the position of the uterus was good. The organ appeared to be enlarged, possibly on account of a fibroid tumour.

PATIENT V.—O., aged thirty years, married, multipara, had had a miscarriage four months previously. There

had been signs of menorrhagia at the last period. She complained of headache and weakness. The uterus was large, patulous and prolapsed to the vaginal introitus. On March 26, 1920, after dilatation and curettage, utero-sacral plication and Gilliam's suspension operation were performed. On February 24, 1922, she had a two months' child at the breast. The labour had been normal. The child had weighed 4.4 kilograms (9 lb. 10 oz.) at birth. The uterus was in good position.

PATIENT VI.—K., aged nineteen years, single, complained of pain in the lower part of the abdomen, especially in the left iliac fossa. The pain was worse after standing or exertion. The patient was examined during anæsthesia. She was found to be a *virgo intacta*. The uterus was retroflexed and the *fundus uteri* was adherent in Douglas's pouch. On May 6, 1920, the parietal ends of the utero-sacral ligaments were attached to the pelvic fascia. Alexander-Adams's operation was also carried out. The patient reported in June and again in August that she was free of pain. The position of the uterus proved to be satisfactory.

PATIENT VII.—M., aged forty years, married, multipara, complained of pain across the back, especially in the right loin. She also complained of frequency of urination. The uterus was retroverted and prolapsed. There was a perineal tear and a cystocele. Internal shortening of the round ligaments had previously been carried out, but the sutured ligaments had given way in child-birth. On March 13, 1920, the perineum was repaired, the utero-sacral ligaments were fixed and Gilliam's suspension operation was performed. On July 13, 1920, the patient was better, but there was still some frequency of urination. On March 2, 1921, the position of the uterus was good, but the disturbance of micturition was still present. She reported that she was well in December.

PATIENT VIII.—H., aged twenty-eight years, married, without children, complained of pain and sterility. She had had her uterus curetted and an Alexander-Adams's operation previously. Neither had improved her condition. On August 6, 1920, utero-sacral plication was carried out. The round ligaments had stretched considerably, but were not treated surgically. She reported on April 19, 1921, that she was five months pregnant. The position of the uterus was good. She was well in December at the end of her pregnancy.[1]

PATIENT IX.—T., aged twenty-eight years, single, complained of headache, pain on the second day of the menstrual period and loss of weight. Treatment was instituted on February 14, 1919, and continued until May 21, 1920. An examination under an anæsthetic on July 18, 1919, revealed a retroversion and prolapse. On May 7, 1920, her menstrual trouble was worse. Dilatation, curettage, Gilliam's operation and utero-sacral plication were carried out on May 21, 1920. There was no occasion for any surgical interference with the tubes or the ovaries. In December, 1920, she was at work, but her condition was little improved.

PATIENT X.—B., aged twenty-four years, married, had utero-sacral plication carried out on August 20, 1920. The record is incomplete.

PATIENT XI.—B., aged twenty-five years, married, without children, sought advice on December 16, 1918, when pregnant. She was conscious of a sensation of bearing down and complained of sickness. The symptoms were relieved on lying down. She was confined on August 14, 1919; chloroform was administered and delivery was effected with forceps. The patient remained well until November, when the feeling of prolapse returned. She sought treatment on June 20, 1920. Her last menstrual period dated three months previously; it had been rather excessive. On examination it was found that the uterus was enlarged and irregular; it was prolapsed and there was great relaxation of the posterior ligaments. At an operation performed on September 20, 1920, five fibroid tumours were removed. The largest was the size of a walnut and the smallest the size of a pea. At the same time Gilliam's operation was performed and the utero-sacral ligaments were re-attached. The operation was faulty. It was noted at the time that there seemed to be too much tension on the utero-sacral ligaments. She remained well until December 23, 1921, when she was again confined. The delivery was completed without the use of forceps. The perineum remained intact. The position of the uterus was good until February 3, 1922, when a slight prolapse was again noted. A Hodge's pessary was inserted.

PATIENT XII.—B., aged twenty-nine years, married, primipara, had been badly torn at her confinement—a brow presentation. The tear had been efficiently repaired. She sought advice on July 1, 1920, on account of abdominal pain, a feeling of weight in the abdomen when standing, frequency of micturition and incomplete control over her bladder. She also complained that she had not conceived since the birth of her first child, which had died. On July 15, 1920, a Gilliam suspension operation and utero-sacral plication were performed and appendicectomy was also done. She presented herself on October 20 and December 28, 1920, and on February 22, 1921. She was considerably better. There was no trouble with the bladder, but the feeling of weight was still present. The uterus was found to be in good condition. She aborted at two months in April, 1921. In September she was again pregnant and felt much better.

PATIENT XIII.—B., aged thirty-six years, married, without children, complained of menstrual pain and excessive loss. On May 14, 1920, it was found that her uterus was prolapsed and that there was an enlargement of the left ovary. Ovariotomy and utero-sacral suspension were performed on June 16, 1920. Both ovaries were cystic and sclerosed. Their removal was not authorized. She presented herself on September 21, 1920, still suffering from menstrual pain. The uterus was in good position, but there was a slight relaxation of the posterior ligaments. There was a cystic swelling to the left of the uterus. This was held to be another cyst in the ovary. On November 7, 1921, her husband reported that she was better. She still complained of menstrual pain.

PATIENT XIV.—J., aged thirty-two years, married, had a Gilliam's and a utero-sacral suspension performed. The record is incomplete.

PATIENT XV.—W., aged forty-one years, married, multipara, complained on December 30, 1920, of prolapse and frequency of urination. There was an almost complete prolapse and well-developed cystocele. Utero-sacral plication and Gilliam's suspension were performed on January 14, 1921. The condition was satisfactory on March 2, 1922.

PATIENT XVI.—L., aged thirty years, married, multipara, complained of pain in the back. The pain was constant, but was worse at night since her last confinement twelve months before. She had been under treatment for several months. The uterus was retroflexed, retroverted and prolapsed. Utero-sacral plication and Alexander-Adams's operation were performed on June 28, 1921. She presented herself on January 14, 1922, when she was feeling well. The position of her uterus was good.

Five other patients have been treated since, but the dates are too recent to justify a record. One patient was operated on in December, 1921, for the re-attachment of the utero-sacral ligaments. Œdema of the left leg appeared, but it subsided after a time.

[1] She was examined on March 28, 1922. The position of the uterus was good.

TUMOURS OF THE BRAIN: THEIR PATHOLOGY AND TREATMENT.[1]

AN ANALYSIS OF EIGHTY-FIVE CASES.

BY HAROLD R. DEW, F.R.C.S. (ENG.),
Walter and Eliza Hall Institute of Research in Medicine and Pathology, Melbourne.

Introduction.

THE following observations are based on an analysis of the cases of brain tumour treated at the Melbourne Hospital during the past ten years. Owing to the incompleteness of some of the records, only

[1] Read before a meeting of the Melbourne Medical Club on September 30, 1921.

eighty-five cases have been used in the series. Most of them have been verified at autopsy and the remainder have been accompanied by such definite symptoms that there can be no doubt as to the diagnosis. These cases have been used in some of the accompanying tables only. The hospital records have supplied the details and though some of the histories were models, many were almost useless for statistical purposes. The absence of a crossed card index system and of a definite follow-up system for cases made the analysis difficult and of necessity incomplete. If these two additions were made to the recording system, the enormous fund of information, both clinical and pathological, in the hospital records would be much more accessible. For the pathological reports those of various hospital pathologists and of the Pathological Department of the University have been taken to supplement a series examined personally. In order to trace the after history where possible, patients who had left the hospital, were circularized with a short series of simple yet searching questions. Though the number brought forward is not large, as compared with statistics published abroad, it is thought that, as it is a local series, it may be of interest.

The Regional Distribution of the Tumours.

As shown in Table I., males predominate and left-sided tumours are more common than right-sided. Frontal and cerebellar growths are almost equal in number and together make up more than 50% of the total. Considering that adults only are dealt with in this series, it is rather remarkable that cerebellar growths are so high in number.

The Age Incidence.

The more definite symptomatology and morbidity of cerebellar growths no doubt leads to more being recognized and a higher verification percentage. Tooth in his large series gives the frequency of frontal tumours as 22% and cerebellar as 17%. The majority of the non-verified tumours, from the clinical and subsequent history, appear to be frontal or deep-seated supra-tentorial growths. Table II., of the age incidence, bears this out to some extent. An interesting feature is the rarity of tumours of the cerebello-pontine angle or other extra-cerebellar growths. None of the former has been discovered at autopsy. In Tooth's series they made up 8% of all verified tumours and Cushing states that they comprised 12% of his series. It has been suggested that these tumours have a familial tendency and this may account for their rarity here. One case of extra-cerebellar tumour occurred; this was a firm, well-encapsulated dural endothelioma growing from the under surface of the tentorium and exerting pressure on the left cerebellar hemisphere. Clinically the patient had both cerebellar and frontal signs. Right sub-temporal decompression was performed without relief.

Excluding the dural growths, only twelve supra-tentorial and six cerebellar tumours appeared on the surface of the brain.

Table II. is self-explanatory and, if allowance be made for the many fallacies possible, it has some points of interest. Where ascertainable, the date of incidence of first symptoms is taken. Owing to the great variation in the mentality and temperament of patients these dates are only approximate. Frontal tumours tend to appear at all ages, with a slightly higher percentage in the middle decades. Cerebellar growths appear earlier and, no doubt, if children had been included in this series, their earlier incidence would be more manifest.

Pathological Nature of the Tumours.

Table III. gives a record of those tumours examined microscopically.

Gliomata.

Gliomata make up 55% of the total, a figure of the same order as those of Tooth, Ewing, Stewart, etc..

The pathological classification of many of the tumours is fraught with much difficulty and the exact definition of some of them is a matter of opinion only. Some would be classed by some pathologists as glio-sarcomata, by others as neuro-cytomata and by others as endotheliomata. Tooth has attached importance to the part played by the small vessels in these growths and has emphasized the pro-

TABLE I.—REGIONAL DISTRIBUTION OF THE TUMOURS.

Region.	Male.	Female.	Right.	Left.	Central.	Totals.	Percentage.
Frontal	13	5	9	9	0	18	25.5
Parietal	5	4	4	5	0	9	12.7
Temporo-Sphenoidal	2	5	2	5	0	7	9.5
Occipital	3	0	1	2	0	3	4.3
Corpus Callosum	1	2	1	1	1	3	4.3
Choroid Plexus	0	2	1	0	1	2	2.8
Basal Ganglia	2	2	2	2	0	4	5.6
Mesencephalon	1	0	0	1	0	1	1.4
Pons	1	1	0	0	2	2	2.8
Cerebellum	12	7	8	10	1	19	27.0
Extra-Cerebellar	0	1	0	1	0	1	1.4
Pituitary	1	1	0	0	2	2	2.8
Not Localized	6	8	?	?	?	14	—
Totals	47	38				85	

TABLE II.—THE AGE INCIDENCE.

Region.	11 to 20 years.	21 to 30 years.	31 to 40 years.	41 to 50 years.	51 to 60 years.	61 to 70 years.
Frontal	2	2	5	4	3	2
Parietal	3	1	1	3	0	0
Temporo-Sphenoidal	0	2	0	1	3	0
Occipital	0	2	0	1	0	0
Corpus Callosum	0	0	1	1	1	0
Chorioid Plexus	1	0	0	0	0	1
Basal Ganglia	0	1	1	2	0	0
Mesencephalon	0	0	1	0	0	0
Pons	0	0	1	0	0	0
Cerebellum	3	5	5	5	0	1
Extra-Cerebellar	0	0	1	0	0	0
Pituitary	0	0	1	0	0	1
Non-Localized	2	2	3	7	0	0
Totals	11	15	20	24	7	5

liferation of the endothelial cells of the vessels and of the peri-vascular spaces. Ewing, too, states that thickening of the vessel walls, even to a state of hyalinosis, occurs, but remarks that, no matter how much irritation and proliferation takes place, it cannot be regarded as a neoplastic tendency. These vascular changes are the cause of intermittent blood supply and help to explain the variability of the pressure symptoms shown by gliomata and the focal necrotic changes so often seen in these growths.

All the above changes have been noted in the series, but in all glial elements predominated and they have been included under the heading of gliomata. The term glio-sarcoma is, in the opinion of most authorities, inexact and has not been used. All the gliomata were infiltrating growths and on section showed many varieties of cell arrangement, such an annulation, giant cell formation and rosette forms.

Cystic change, both macroscopic and microscopic, was very common, occurring most frequently in the cerebellum. Some of the cysts of the cerebellum were large, smooth-walled cavities and apparently had no neoplastic tissue in the walls, but search invariably revealed gliomatous tissue in the sections. On section of the multi-loculated cystic growths, swelling and distension of glial cells with mucoid material, cystic spaces and channels lined with quasi-ependymal cells and filled with fluid or granular débris, as well as areas of necrotic change were noted. In the case of some of the large cysts there appeared to be but little increase in size of the cerebellum suggesting that the cyst was of a replacing nature.

Endotheliomata.

The endotheliomata were six in number. One was of definite hæmangio-endotheliomatous nature and occurred in the *corpus callosum*. The others were true dural endothelioma. They were firm, well-encapsulated growths, did not infiltrate the brain substance and from the point of view of removal were the most satisfactory of all the tumours encountered. They were characterized by long histories and with one exception were supra-tentorial in situation.

Tuberculomata.

One example of a tuberculoma occurred in a patient who was suffering from generalized tuberculosis. In the figures compiled abroad it is said to comprise 6% to 7% of all tumours, even in adults. When recovery takes place in the presence of the signs of tumour after a simple decompression or even spontaneously, this is the lesion usually con-

TABLE III.—PATHOLOGICAL NATURE OF THE TUMOURS.

Region.	Gliomata.	Endothelio-mata.	Sarcomata.	Secondary Neoplasms.	Simple Cyst.	Papillary Cancers.	Gummata.	Tuberculo-mata.	Adeno-Carcino-mata.	Hydatid.
Frontal	8	1	1	1	0	0	3	0	0	2[1]
Parietal	3	0	0	2	0	0	0	1	0	1[1]
Temporo-Sphen'idal	2	2	0	0	0	0	1	0	0	0
Occipital	1	1	0	0	0	0	0	0	0	2
Chorioid Plexus	1[2]	0	0	0	0	1	0	0	0	0
Basal Ganglia	1	0	0	1	1	0	0	0	0	0
Mesencephalon	1	0	0	0	0	0	0	0	0	0
Pons	1	0	0	0	0	1[3]	0	0	0	0
Cerebellum	10	0	0	0	1	0	0	0	0	0
Extra-Cerebellar	0	1	0	0	0	0	0	0	0	0
Pituitary	1	0	0	0	0	0	0	0	1	0
Corpus Callosum	1	1	0	0	0	0	0	0	0	0

[1] Hydatids were multiple. [2] Glioma of *velum interpositum*. [3] Cancer of chorioid plexus of fourth ventricle.

sidered to be present. The following is the history of a probable case of this nature:

A.A., male, aged four and a half years, was admitted on February 1, 1915, with failing sight in the left eye and blindness of the right eye. On previous examination he had homonymous hemianopsia of the outer half of both discs, headache, a tendency to fall to the left, a tendency to fall back and to the left when walking and much increased reflexes on the right side. Left post-parietal decompression was performed, meningitic adhesions were separated and a small tumour, which was thought to be an hydatid at first, was seen. On further examination it was considered to be tuberculous. The cranial wound was closed and the patient made an uninterrupted recovery.

These tumours are usually held to be much more common in children; in the figures of Hale White they are placed as high as 45% of all tumours. In this country they are apparently very rare and in the records of the Children's Hospital are only occasionally met with.

Hydatid Cysts.

Hydatid cysts occurred in two young subjects of fifteen and seventeen respectively. In both the cysts were multiple, three and five in number. In contradistinction to the usual description the adventitia was tough and well developed. In neither was the condition diagnosed. The one patient died of meningitis, in spite of drainage, and in the other the cyst was not discovered. No doubt the application of the complement deviation test to the blood and the cerebro-spinal fluid in the future will help in the diagnosis of these cases.

Gummata.

Gummata were noted four times. Three were cortical and were associated with a localized meningitis and all ran a fairly rapid course. The well-known resistance of these granulomata to active treatment with mercury and potassium iodide, together with their non-recurrent nature, makes surgical removal a suitable form of treatment. Some excellent results have been published from time to time.

Secondary Neoplasms.

The secondary neoplasms are included for their pathological interest mainly. They were characterized by their multiplicity and were secondary to carcinoma of the mamma, lungs and to melanoma of the skin.

One interesting feature of the pathological reports was the occurrence of dilated ventricles in six instances. The site of tumour in these cases was as follows: Cerebellum, four times; thalamus, once; *velum interpositum*, once. Three of the patients died suddenly of respiratory failure; the others all showed bilateral spasticity.

The Clinical Aspects.

An attempt has been made to correlate the clinical aspects with the autopsy findings, although the many fallacies possible are obvious. The histories given by patients vary according to his or her temperament, observation or intelligence. In general, patients show little appreciation of the slight, yet very important, early symptoms of cerebral functional upset. Such symptoms as loss of judgement, variations of temper, irritability, forgetfulness or loss of abstract conception in most of the hospital class of patients, pass unnoticed until severe headache or vomiting forces them to seek relief or until the clinician elicits them by questioning. Yet it is only by a study of these early symptoms that we can hope to improve our diagnosis. The classical signs of optic neuritis and vomiting are pressure effects and often late ones; by the time they have arisen, it is often too late to hold out much hope from surgical interference.

The following is a summary of the facts relating to each main symptom:

Headache.

This was the commonest symptom; of the seventy-eight patients, it was the initial symptom complained of in fifty. In all it appeared at some time or another. The three patients with frontal lobe tumours suffered from persistent occipital headache, with occasional attacks of frontal pain; in the remainder the headache was confined to the side of the lesion and in the main to the front of the head. In the cases of cerebellar tumour it was occipital in twelve, frontal in five, both occipital and frontal in one and unspecified in five. Thus 30% of cerebellar tumours were associated with frontal headache. This misleading nature of headache in brain tumour is commented on by all writers on the subject. As Collier says, it is probably due to counter-pressure and is specially liable to occur late. In the basal and deep sub-cortical tumours its nature, side and position varied so much as to be of little or no localizing value.

Mental Changes.

These were specially noted in fifteen patients; in ten the growth was situate in the left frontal lobe. Aphasia was noted in five. It appears from some of the histories that aphasia and mental changes were often confused with one another. The predominance of the left hemisphere in producing symptoms was well shown in this group. In nine only were mental symptoms the first symptoms noted. Only one sub-tentorial tumour gave rise to well-developed mental changes; these appeared only in a late stage of the disease. In this connexion it is interesting to note that at the Kew Mental Hospital brain tumours are only found on an average once in every five hundred autopsies.

Convulsions.

Fits of various types were noted in twelve patients and as initial symptoms in eight. These tumours were distributed as follows: Left temporal, three times; parietal, three times; temporo-sphenoidal, twice. The occurrence of fits in association with the frontal lobe tumours appeared to be a late manifestation and was due to an extension of the neoplasm backwards. No doubt vascular changes in advance of a growing tumour produce like symptoms. Fits of cerebellar type, as recorded by some authorities, were not met with in this series.

Ataxia.

This was typically a cerebellar manifestation, but was noted in connexion with three frontal tumours. It appears, however, from the history of the illness of each of these patients that it was

atypical and it is not improbable that it was due to lack of judgement and inattention rather than to true ataxia.

Ocular Muscle Paralysis.

In the greater number of cases this was due to involvement of the sixth cranial nerve. It was noted in eighteen patients. The regional distribution of the tumours was as follows: Right frontal lobe, five; left frontal lobe, two; *corpus callosum*, one; left temporo-sphenoidal lobe, two; left parietal lobe, one; cerebellum, four; mesencephalon, *pons varolii* and *thalamus opticus*, one each. No constant relationship could be made out between the side of the paralysed nerve and the site of the tumour. This bears out Collier's statement that, owing to the long intra-cranial course of these nerves, they are specially liable to tilting and pressure effects, which may be produced by even remotely situated growths. Third nerve paralysis occurred only three times.

Optic Neuritis.

This was present in forty-six and was noted in the records as absent in two. Failing vision was present in nine and in twenty-eight no note was made as to the state of the fundus. In the forty-four patients operated on it was present in all except six.

Reflexes.

The condition of the reflexes was incompletely noted in many of the histories. In the rest the reflexes appeared to be remarkably variable. In frontal tumours they gave, as a rule, little reliable information until the tumour began to affect the præcentral area and to induce motor changes. Absence of the superficial abdominal reflexes, when noted, gave the most reliable and constant indication as to the side of the lesion in the early stages. In the presence of cerebellar tumours the reflexes were even more variable, sometimes from day to day, and were often totally misleading.

Nystagmus.

This was present in sixteen patients suffering from cerebellar tumour and was noted as absent in three, one of whom had paralysis of all the eye muscles. It was absent in association with a left lateral cerebellar cyst and a glioma of the vermis. Nystagmus was also noted in two other patients with tumours. One of the tumours was an occipital dural tumour pressing on the left cerebellar hemisphere and the other a growth of the anterior part of the *corpus callosum*. No exact description of the degree or phases of the nystagmus was given in the majority of the histories. The special investigation methods of the labyrinthine and cerebellar functions have only been used of late and then not in every case, so that the records are of little statistical value in this respect. In the majority of cases in which they were used, the results were extremely accurate. Few, if any, cerebellar lesions should be missed if these tests were properly applied.

The Diagnosis.

Owing to the lack of detail in many of the histories, accurate deductions and fair criticism of the diagnosis are very difficult. In only a few cases was the opinion of the consultant given before operation or autopsy. If this information were insisted upon, the value of the records would be greatly enhanced. Taking the operative procedure as an indication, it is found that the side was correctly localized in thirty-four out of the thirty-six verified tumours. Sub-temporal decompression was performed twice for sub-tentorial growths and sub-tentorial exploration twice for supra-tentorial ones. This latter is a well-known operative *faux pas*; in both instances death followed rapidly. Tumours just above or below the tentorium were the source of several unfortunate diagnostic errors. There were four tumours in this region, three in the occipital lobe and one below the tentorium. Two were easily removable endotheliomata and in each case the wrong side of the tentorium was opened and nothing found. In most of the cases the diagnosis of tumour was not made until the appearance of gross pressure symptoms. There was a tendency in some to await the appearance of optic neuritis before the diagnosis was attempted and surgical interference mooted. Surely with the many accessory and improved methods of diagnosis at our disposal, some improvement can be confidently expected.

The Operative Measures.

As regards the site of operation, the consensus of surgical opinion is that the ideal site for craniotomy is over the tumour. This allows removal whenever this is possible. Failing that, it allows the tumour to be pushed through the opening, where it is accessible to radium or X-ray therapy and it also prevents strangulation and dislocation of adjacent brain tissue. If the tumour cannot be localized, palliative decompression should be performed for the relief of the severe general symptoms. In fulfilling its purpose, this is one of the most successful of operative procedures. The sub-temporal area is considered to be the best site, as it is over a quiet region of the cortex and the temporal muscle and fascia have a restraining influence on the inevitable cerebral hernia. The frontal area is unpopular, because of the difficulty of obtaining a restraining covering and for cosmetic reasons. In the cases of frontal tumours in this series, only one frontal exploration was performed. It appeared as if either the late motor symptoms so dominated the clinical aspect of the cases that the tumours were localized in the motor area or else the operation in each case was regarded as a purely palliative measure.

Considering the frequency of frontal tumours and their habit of producing motor symptoms, it seems as if frontal decompression should be more frequently performed. A much larger craniectomy than usual, in conjunction with a fascial graft over the dural defect, should obviate to a great extent the liability to an open cerebral hernia. Bilateral decompression, too, has a wider range of usefulness in these cases than is shown in these operative records. Again, if the frontal decompression is not satisfactory, sub-temporal decompression can always be combined with it. The operative methods have altered considerably and mark the various advances year by year in this branch of surgery. Operations

TABLE IV.—OPERATIONS.

Region of Tumour.	Situation of Approach.							
	Sub-Temporal.		Frontal.		Post-Parietal.		Sub-Tentorial.	Bilateral.
	Right.	Left.	Right.	Left.	Right.	Left.		
Frontal—								
Right	3	1	—	—	—	—	—	—
Left	—	3	—	1	—	—	—	1
Parietal—								
Right	2	—	—	—	—	—	—	—
Left	—	2	—	—	—	—	—	—
Occipital—								
Right	1	—	—	—	—	—	—	—
Left	—	—	—	—	—	1	1	—
Temporo-Sphenoidal—								
Right	1	—	—	—	—	—	—	—
Left	—	2	—	—	—	—	1	—
Basal Ganglia, etc.—								
Right	—	—	1	—	—	—	—	—
Left	—	2	—	—	—	—	—	—
Extra-Cerebellar—								
Right	—	—	—	—	—	—	—	—
Left	1	—	—	—	—	—	—	—
Cerebellar—								
Right	1	—	—	—	1	—	4	—
Central	—	—	—	—	—	—	1	—
Left	—	—	—	—	—	—	6	—

are performed more frequently and no longer are small trephine openings considered sufficient for decompressive purposes. Unilateral sub-tentorial craniectomy, with its huge mortality, has been superseded by the bilateral operation, with removal of the posterior arch of the *foramen magnum*, with a subsequent diminution of the operative mortality. With the adoption of the full Cushing technique a still lower mortality should be obtained.

As a general rule the gliomata, by the time they are diagnosed, are surgically irremovable. As judged by autopsy findings, the tumour which lends itself to most perfect removal, is the dural endothelioma. The four examples of this tumour in the series were surgically removable. Hydatid cysts, if single and in an accessible position, should be amenable to surgery. Cystic conditions of the cerebellum were operated on in three instances, with evacuation of the contents. All the patients were materially benefited and life was prolonged. As all these tumours undergo gliomatous change in their walls, excision of the cyst wall appears to be indicated. Two other interesting conditions were met with in this analysis. These were two cases of long standing, probably post-traumatic blood cysts, which clinically resembled brain tumour and which could have been dealt with surgically. Conditions which were considered to be cerebritis, were also noted, with recovery after decompression. Such cases are additional reasons for urging early surgical interference whenever signs of increased intra-cranial pressure are encountered and for exploring rather than being content with a purely palliative operation.

Results of Operative Treatment.

There were six deaths at or within twelve hours of the operation. All these could be said to have been operative fatalities. Four of the patients had been suffering from cerebellar tumour and of the four three had manifested the signs of internal hydrocephalus.

Four deaths were due to meningitis, apart from the late infection of a cerebral hernia, which was a common terminal event. Two of these followed the two-stage operations.

Codman has drawn attention to the frequency of meningeal infection after the two-stage operations and has maintained that, if the patient's general condition remained good and the blood pressure high, the operation should be always completed in one stage. In this connexion it is interesting to note that Cushing's mortality from meningitis in his last series was only 1%.

Excluding these fatal cases, there remain only twenty-six of which details are available to examine end results; that is, in regard to verified tumours. The site of the tumour was not verified in eight patients on whom operations had been performed. All of these developed cerebral hernia and with one exception all are dead. This patient had bilateral sub-temporal decompression performed and in spite of a large cerebral hernia, she has remained free from headache and her mental condition is good sixteen months after operation. In this connexion the lack of a "follow-up" system is unfortunate, as in the majority the effect of the operation cannot be ascertained.

In many patients the lesion was far advanced and the operation was obviously a last resort—a palliative proceeding. To take end-results in such circumstances gives a very wrong impression of the efficacy of surgical interference. The tumour was not removed from any of these patients. In three

instances a cyst was drained and only five times was a tumour discovered at operation.

Fourteen patients with supra-tentorial tumours were operated on; five had no relief and died at varying times within six months of operation. In the remaining nine the immediate result was good. The total survival period from the onset of first symptoms to the death of the patient with supra-tentorial growths untouched by surgery averaged nine months; the shortest period was two months and the longest four years. In the patients operated on, the average survival time was apparently not increased, although improvement of the sight and of the mental state and loss of the continual headache were noted in all.

In the twelve sub-tentorial operations the result was temporarily good in all. In three instances, in two of which a cerebellar cyst was drained, the survival periods after operation were as follows: Eleven, twenty-nine and thirty-eight months. The average survival time after operation was twelve months, as compared to eight months in the case of patients not operated on.

Conclusion.

In the foregoing paper much interesting detail has been suppressed in order to generalize. Such important problems as the question of the anæsthetic, the methods of combating increased dural pressure at operation, the newer operative technique and the recent improvements in diagnosis, have all been left untouched. In reviewing the facts as put forward, the diagnosis and treatment are, I think, disappointing when compared with the figures of British, American and continental workers. Too often surgical interference was delayed too long because of delay in diagnosis. With the fuller adoption of the newer aids to diagnosis, there is no doubt that few of the sub-tentorial tumours will escape detection and more of the others will be correctly localized.

It rests with the clinicians of our hospitals whether we are to be content with these results or whether, by closer co-operation of physician and surgeon, we can advance in the detection and treatment of these depressing, but by no means always, hopeless cases.

References.

Tooth: *Brain*, 1912.

Collier: *Brain*, 1904, Volume 27, Part 4.

Dandy: *Surgery, Gynecology and Obstetrics*, April, 1920.

Mills: *University of Pennsylvania Medical Bulletin*, April, 1906.

Rendle Short: "Index of Prognosis."

Von Eiselberg: *Archiv für Klinische Chirurgie*, September, 1913, page 399.

Tooth: *Reports of Seventeenth International Medical Congress*, Section 7, page 202.

Kuttner: *Revue de Chirurgie*, 1913, page 646.

Dandy: *Bulletin of Johns Hopkins Hospital*, 1916, No. 27.

Cushing: *The Journal of the American Medical Association*, 1915, No. 64.

Weed and McCubbin: *American Journal of Physiology*, 1919, Volume 48.

Codman: *Boston Medical and Surgical Journal*, 1905, July 24.

Foley: *Surgery, Gynecology and Obstetrics*, 1921, August.

THE SCHAFER METHOD OF ARTIFICIAL RESPIRATION.[1]

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As Commissioner for New South Wales of the St. John Ambulance Brigade, upon the members of which the carrying out of resuscitation so extensively falls and in view of the frequency of calls for its application in a country where surf-bathing has so vastly developed, it has seemed to me desirable to gather what I could of the details of Schafer's method (for they are often curtailed and sometimes varied with more than doubtful advantage) and to make some additional suggestions the outcome of my own experience.

In the *Proceedings of the Royal Society of Edinburgh* (Volume 25, Part I., page 43) Schafer published certain researches which may be summarized as follows (see table on next page): The same individual was used for the experiments throughout and a spirometer or graduated gasometer employed. The subject was a male, aged twenty-three years, whose weight was 64.2 kilograms (10 stone 1½ pounds), whose vital capacity was 4,450 cubic centimetres and whose height was 171.1 centimetres (5 feet 7½ inches). The pressure of the operator's hands was reckoned as 27 kilograms (60 pounds). The air pumped out of the chest alone was measured.

From the table it will be seen that by Schafer's method the expired air was nearly twice that of Howard's method or Marshall Hall's method with pressure and almost three times that of Silvester's method or Marshall Hall's method without pressure.

The Royal Society of Medicine in London replied to an inquiry from the Chief Surgeon of the Metropolitan Police that Schafer's method is best to the exclusion of all others. It is simple, very available, can be carried out by one person and instructions are not capable of being misunderstood.

The method is described in a paper communicated to the Royal Medical Chirurgical Society and read on December 8, 1903, and published in the *Medical and Chirurgical Transactions*, which I have not been able to find here.

The method, as summarized in the *Lancet* (Volume II., December 12, 1903, and Volume I., March 27, 1909) is as follows:

Do not waste time by removing clothing! Put yourself athwart the patient's body in half-kneeling posture, facing the head! Place hand over the lower part of the back of the chest, one on each side, and gradually throw the weight of your body forward on to them, so as to produce firm pressure, which must not be violent, upon the patient's chest! By this means the air and water are driven out of the patient's lungs. Immediately thereafter raise your body slowly, so as to remove the pressure, but leaving your hands in position! Repeat this forward and backward movement of pressure and relaxation of pressure every five seconds! In other words, sway your body slowly forward and backward upon your arms about every five seconds without any marked pause between the movements! This course must be pursued at least half an hour

[1] Read at a meeting of the Divisions of the New South Wales District of the St. John Ambulance Brigade, Overseas, on March 27, 1922.

Form of Respiration.	Rate of Respiration.	Position.	Expired Air.
Natural	13 per minute	Supine	489 cubic centimetres = 30 cubic inches
Natural	13 per minute	Prone	422 cubic centimetres = 25¾ cubic inches
Silvester[1]	13 per minute	Supine	178 cubic centimetres = 10¾ cubic inches
Howard[2]	13 per minute	Supine	255 cubic centimetres = 15¾ cubic inches
Marshall Hall	12½ per minute	Rolling without pressure	192 cubic centimetres = 11¾ cubic inches
Marshall Hall	12½ per minute	Rolling with pressure	254 cubic centimetres = 15¾ cubic inches
Schafer	13 per minute	Prone	520 cubic centimetres = 31¾ cubic inches

or until natural respirations are resumed. If they are resumed and, as sometimes happens, again tend to fail, the process of artificial respiration must again be reverted to as before. Whilst one person is carrying out artificial respiration, the others may, if there be opportunity, busy themselves with applying hot flannels to the feet; but no attempt should be made to remove the wet clothing or to give any restoratives by the mouth until natural breathing is established.

It will be seen from Schafer's experiments that his method alone affords the amount of in- and outgoing air needed to provide for sustaining life and this fact is the more important since evidently the air tubes in the person rescued from drowning are not so open as in a healthy one and this condition would retard the air current passing to and fro in them.

Except with Laborde's method (*i.e.*, that of pulling on the tongue), the learning of several others more or less similar to each other often engenders mental confusion and consequent imperfection in carrying out any of them properly. Moreover, in Howard's method the ribs have not infrequently been broken, whilst Silvester's rapidly exhausts and is awkward to carry out. But Schafer's method has special value, for, by exerting upward pressure, it effects a stimulating action on the heart. Moreover, as in cases of suffocation (asphyxia) from any cause the liver is enormously swelled and softened and thus more liable to rupture, it is less exposed to injury with the patient on his face, as Schafer's method requires, than in the case of the others.

After recovery some suggest that the patient should be placed on his right side, because it is congested and the left lung empties itself easier than the right of water, slime, etc..

Variations from the above simple and clear instructions have been introduced and persisted in and even to-day are extensively taught. Especially common is the bending of the elbows as the operator comes forward, his body dropping and rising with a jerk more or less violent. Less serious a variation is the sudden release of pressure as the operator slips back into the half-sitting position on his haunches and also the removal of the hands from the patient's side. Possibly these are introduced with the object of stimulating respiration, but as the tissues of the lung have not the time to accommodate themselves, injury to them may result from the sudden increase and release of air pressure in the tubes, which is far greater than is perhaps imagined. Ths risk of subsequent lung troubles is therefore self-evident.

Besides the above, one should remember that the stomach is often more or less full of food or air and consequently liable to suffer from the pressure exerted, especially if the patient be young, weak and thin, with consequently relatively collapsible ribs. It must be borne in mind that the type of breathing to imitate should be the natural one, which is regular, gently undulating, without pause at the beginning or end of a breath and one which in the adult occurs twelve to fifteen times in a minute. In suffocation the air tubes, being more or less collapsed, as before mentioned, the air, having evidently more obstruction than usual, will take a longer time to pass in and out. This therefore indicates that there should be rather slowing than quickening of the frequency of respiratory movements. Three seconds for the forward and two for the backward movement may be taken as a guide.

Directly the patient is sufficiently far from the waves or seat of the accident to insure safety, artificial respiration should begin at once. To take him or her to a shed a hundred or more yards away, as is sometimes done, is inexcusable, nor need one, except under extremely unusual circumstances, trouble about the neck clothing being tight, for a second lost in instituting the artificial respiration may mean a patient's death.

If one look at the shape of the chest of a human being, it will be seen that the main air tube (trachea) is set in it much as a neck in the body of an ordinary bottle, so that when lying down, even on his face, the water (if the patient has been submerged) would not all run out of itself. Now, though respiration may more or less effect this extra emptying, on the whole it would be best to keep the head directed downwards towards the sea; that is, slightly lower than the body. By placing rapidly the patient's forehead on his hand or wrist, there results a slight tension on the front of the neck and this tends to pull the root of the tongue forward and so to allow freer passage in and out of the air. A bystander could do this and clear away sand, etc., from under the mouth or turn the head slightly to one side and so permit the operator to start more quickly. To attempt to raise the lower part of the chest by a pad under it or under the abdomen for the purpose of draining out the water from the chest would lessen the in-current of air through the weight of the patient's body continually pressing on it; it would also waste valuable time in carrying out. In like manner, in a boat the patient's head would best be towards the stern, for, if the weather at all permitted, the

[1] Silvester's method is with forcible traction of the arm. The exertion was too great to have been kept up for long. The subject could scarcely restrain his efforts to breathe, for the amount of air was quite inadequate.

[2] Howard's method involves intermittent pressure on the ribs.

patient should, if possible, be treated in the boat on the way to the ship or shore.

Note that Schafer used the word "athwart" the patient. Many diagrams show the operator at the side. This means a slanting movement of his body, which must imply an unequal pressure on each side of the chest and therefore very decidedly lessen the efficiency of the method. With the "athwart" method, the fore and aft sliding movement gives equal pressure on both sides of the chest, the pressure being simply that of the operator's body, by which the shoulders as they go backwards and forwards resemble the rim of a wheel rotating for about one-sixth of a circle round each wrist, which represents the nave, and each arm a spoke, for the wrists only slightly rock, while the elbow does not bend.

I may now add three suggestions which experience has shown of importance in practice.

In diagrams it is usual to see the thumbs directed forward parallel with the spine. In this position they cannot assist breathing, but as the operator's shoulders come forward, a strain is thrown on the joint between the thumb and the wrist, which very readily causes pain—sometimes severe—and as a result a tendency to jerking movements in the operation. The operator may at last be unable to continue. Further, if the thumbs point straight forward they prevent the operator going beyond the perpendicular with his arms. For the operator of average size and weight this possibly may be useful as a guide, but for a light operator more weight can be brought to bear and without pain to him if the thumbs are out of the road and his knees be brought well forward towards the patient's head, for these allow more weight to be employed and that without discomfort. It is far better, therefore, for the thumbs to be directed outwards, close alongside of the index fingers. By experiment I have found it possible thus to add 50% to the weight exerted without causing weariness. Again, if the wrist and palm are rightly placed on the lower ribs, it matters little what the fingers or thumbs do, as they carry little weight, the latter being chiefly on the balls of the thumbs and wrists. It is solely the weight of the operator as imparted to the patient's ribs which acts.

Again, patients and operators vary greatly in physique and evidently a lightly built, unskilled operator may not effect what he could if trained in the case of a stout patient and one whose tissues (cartilages, etc.) are stiff with age. On the other hand, a strong, sturdy, unskilled operator may easily do great damage to a slight and thin, young child through employing undue vigour and weight.

It is purely the weight of the operator's body, as conveyed down the arms, which squeezes the air out of the chest. A light person, operating by bringing the knees further forward, brings more of his weight on to his arms when he slides his head and shoulders forward, while, when he slides back, all his weight is removed. So a heavy person, by placing his knees well back, can tone down his pressure to any degree needed; tact permits him to know when on his forward movement he has sufficiently pressed on the patient's ribs. It is in this forward movement that jerking is specially dangerous. A light person may even require a bystander to put supports under his knees to raise them so that he can spread them athwart a stout patient. One has to face the fact that a light person might easily be ineffective or a heavy person too violent, in each case failure resulting ultimately.

Finally, to secure uniformity of pressure, one has only to note a spot on the ground that becomes just visible in front of the patient's head each time the operator's head has finished coming forward. After a short while this limiting of movement becomes mechanical and is regulated by muscular sense. Experience has shown that careful attention to the above details would avoid some serious objections which have been raised against Schafer's method.

Laborde's Method.

In pulling forward the tongue it is well to note that the tongue rotates somewhat like a solid wheel, the frænum and base of the tongue acting as the nave. It is therefore best in pulling it out to direct the tip down and forward. This pulls the back of the tongue out more effectually and avoids injuring the frænum and other tissues.

Reports of Cases.

ACUTE POLIOMYELITIS.

BY M. O'SULLIVAN, M.B., B.S.,
Casterton, Victoria;
AND
J. G. SLEEMAN, M.B., B.S.,
Merino, Victoria.

THE following case of poliomyelitis is reported as showing some interesting features:

C.M., *ætatis* 28, a slaughterman, arrived in Merino from Melbourne on January 21, 1922, in good health. On January 24 he went shooting and said that he caught "a chill." On the following day he complained of headache, pain between the shoulder blades and in the legs and a desire to vomit.

I examined him on January 25, 1921. He was a well nourished man of good colour. He was lying comfortably in bed. His pulse-rate was 96, his respiration was normal and his temperature 39.4° C.. His pupils were equal and reacted to light and to accommodation. His tongue was moist and furred. No signs of pathological changes in the throat, lungs, heart, abdomen or limbs were detected.

On January 27 he was still complaining of pain in his legs, but the pain in the back had shifted down to the sacral region. He was unable to sleep and vomited all food. His breathing was shallow and rapid. His colour was good. His pulse-rate was 100, his respiratory-rate 30 and his temperature was 39.2° C.. No physical signs of anything abnormal were elicited.

On January 29, 1922, the patient reported that he had been unable to move his right arm during the previous night and that on awakening in the morning he had found that his left leg was paralysed. The pupils were equal and reacted naturally. There was no squint. The right arm was paretic, but the left arm was normal. The biceps tendon reflex was active on the right side and was equal to that on the left side. The left leg was paretic. No knee-jerk was elicited on the left side. The right leg was unaffected and the knee-jerks were natural. The plantar reflexes were flexor in response.

The breathing was shallow. The patient no longer complained of pains, but he vomited everything. The pulse-rate was 84, the respiratory-rate 30 and the temperature 37.2° C..

At this stage Dr. Cust saw the patient with me in consultation. The patient was sent to Casterton Hospital.

Eight hours later the patient was conscious, complain-

ing of pain in the back of the head and neck, difficulty in breathing, weakness in the right arm and in both legs. The neck was rigid, but there was no tenderness present around the neck or shoulders. The intercostal muscles were working feebly, but apparently with sufficient power to maintain respiration. The condition of the limbs was unchanged, with the exception that the right leg was now distinctly paretic. The right knee-jerk could not be elicited. Kernig's sign was not present.

Some weakness of the bladder and rectum was noticed, but the patient could relieve himself after a little difficulty. No rash was present. The temperature was 37.5° C., the pulse-rate 84 and the respirations 30 in the minute.

On January 30, 1922, the condition was unaltered, except that the weakness in the legs was more marked. At 6.30 p.m. the patient became cyanosed and could not speak. The movement of the chest muscles was absent and the breathing became purely diaphragmatic. Unconsciousness supervened and the patient died at 7.30 p.m..

The points of interest are:

1. The sporadic nature of the case. The patient could not remember any person with whom he had been in contact having been ill in any way. No other cases of poliomyelitis have occurred in the town or district.
2. The age of the patient.
3. The early paresis of the intercostal muscles, apparently before any limb disability was noticed.
4. The direction of the spread of the lesion, first downward and then upwards, and the definite way in which the pain corresponded with this spread.
5. The continuance of the spread of the lesion after the fall in temperature from 39.5° C. to 37.2° C. and the maintenance of the temperature at this level, with the exception of a slight rise to 37.5° C..
6. The persistent vomiting.

Reviews.

THE PREVENTION OF DISEASE.

THE busy general practitioner or the medical student who desires a handy, up-to-date and accurate summary of modern ideas and methods in the prevention of disease cannot do better than secure a copy of "Practical Preventive Medicine," written by Mark Boyd, Professor of Bacteriology and Preventive Medicine at the University of Texas.[1] In his foreword the author disclaims any originality and further disarms criticism by admitting that some important subjects may have been inadequately treated because of the great condensation necessitated by the attempt to cover the whole field in so small a volume. The reader who desires a full treatment of a particular subject, will quickly realize the truth of this; the value of the bibliography inserted at the end of each chapter is discounted for Australian readers, as most of the references are admittedly to American journals. A single page summary on pulmonary tuberculosis certainly seems inadequate and the reader who has not heard of the Weil-Felix reaction or the Tieche sensitization test, will regret that the author did not give at least as full a description of these tests as he does of the Schick test.

The chapter on disinfectants is deficient and contains no description of any method of steam disinfection. These defects also detract from the claim of the work to be entitled "Practical Preventive Medicine." On the whole, however, a wonderful amount of accurate information has been compressed into this small volume. This is partly due to the form of the work, which suggests that the author has utilized the headings of his lectures in laying out the scheme.

The book is divided into eight sections, dealing respectively with epidemiology, deficiency diseases, occupational diseases, special aspects of hygiene and sanitation, statistics and public health administration. Two-thirds of the work deal with epidemiology, contact, transmission. The methods are summarized as those (*a*) transmitted solely by contact, (*b*) usually by contact, (*c*) frequently by contact. The summary of each disease follows a definite plan; if any one summary is taken and studied, it will be found that every phrase conveys a very definite meaning. In this way a very accurate picture is presented in a small space. The section on contact infection contains an admirable summary of the carrier state. In the chapters on contact transmission the author discusses the whole question, although the account is marred, either through carelessness or a printer's error, by the unmistakable use of the word "unusual" where it is evident that "usual" is meant.

There is a most valuable and unusual chapter on "other aspects of infectious disease," in which the author emphasizes the much neglected point that the damage and loss from the sequelæ of these communicable diseases is just as important as the loss from mortality. He quotes Dublin's investigations with reference to typhoid fever, which showed that the mortality amongst those who have recovered from the disease, is in the three years following the attack twice as great as that amongst individuals who have never had the disease. Practically no notice has been taken in Australia of this investigation. Similarly in regard to puerperal disease the writer shows that in America (as in Australia) puerperal septicæmia reveals no diminution and that deaths from all puerperal causes are tragically high.

The value of the work is considerably enhanced by the photographs and other illustrations which abound in most sections, as well as by the tables and diagrams, which are of particular value to students, in that they present information at a glance. There are a few minor inaccuracies, one of which has been mentioned above. These will doubtless be removed in a second edition. And while it is perhaps hardly fair to look for style in a summary, it is a pity that the general clearness and conciseness of the summarizing should be marred in places by uncouth sentences which at times even obscure the meaning. This is especially noticeable in the chapters on contact transmission. But these are only minor defects. The facts given are accurate and up to date. The views expressed are generally sound. For these reasons the book can be commended to that general body of practitioners who, as the author says, "are at present neglecting their opportunities in the field of preventive medicine and public health. If this neglect continues, the opportunities will lessen and the field be taken away by a changing public sentiment."

[1] "Practical Preventive Medicine," by Mark F. Boyd, M.D., M.S., L.P.H.; 1920. Philadelphia and London: W. B. Saunders Company; Melbourne: James Little; Royal 8vo., pp. 352, with 135 illustrations. Price: 24s. net.

Naval and Military.

APPOINTMENTS.

THE following have been granted substantive rank as from January 1, 1922, except where otherwise stated, as notified in the *Commonwealth of Australia Gazette*, No. 35, dated April 27, 1922:

Australian Military Forces.

SECOND MILITARY DISTRICT.

To be Lieutenant-Colonels—MAJOR (HONORARY LIEUTENANT-COLONEL) CHARLES FRANK WARREN and CAPTAIN (HONORARY LIEUTENANT-COLONEL) WILLIAM ERNEST GRIGOR, O.B.E., Reserve of Officers.

To be Majors—CAPTAINS (HONORARY MAJORS) STEPHEN HERTFORD WEEDON, NORMAN KEITH ROBERTSON, SYDNEY VERE APPLEYARD, D.S.O., and KEITH MOORE WHITING, Reserve of Officers.

To be Captains—HONORARY CAPTAINS WILLIAM HENRY WESTON, M.C., HORACE LEIGH DECK, SYDNEY STEWART SHIRLOW, WILLIAM ROBERT THROWER, GEORGE ARTHUR BROOKES, JAMES MANNING HAIR and HAROLD THEODORE MARSH, Australian Army Medical Corps Reserve; HONORARY CAPTAIN OLIVER LATHAM, Australian Army Medical Corps Reserve, 1st October, 1920. (This amends the notification respecting this officer which appeared in Executive Minute No. 118/1921, promulgated in *Commonwealth of Australia Gazette*, No. 27, dated 24th March, 1921.)

THIRD MILITARY DISTRICT.

To be Captain—DONALD MURRAY ROSS.

RETIRED LIST.

Second Military District.

To be Colonel—SIR ALEXANDER MACCORMICK, 1st January, 1922.

The Medical Journal of Australia

SATURDAY, MAY 13, 1922.

The Medical Research Council.

THE ANNUAL REPORT OF THE MEDICAL RESEARCH COUNCIL for the year 1920-1921 contains a vast amount of important information. None of the five annual reports of the Medical Research Committee nor the first report of the Medical Research Council can compare with it in regard to detail or enterprise. This report demands consideration in Australia, not only because it contains a summary of an extraordinary amount of research, but chiefly because some day soon medical research must be organized in the Commonwealth and there are lessons to be learned from its pages. Parliament provides the money necessary for the prosecution of medical research in the United Kingdom. Originally the Medical Rsearch Committee was established as part of the national insurance scheme and received its subsidy out of the contribution ear-marked by the Government for the "tuberculosis benefit." The idea of restricting the activities of the Committee to investigations connected with tuberculosis was not contemplated, even in the early days before the Act came into force. In 1914 machinery was created of considerable magnitude in order that the Committee might initiate any form of medical research and might coordinate the various existing agencies. Five years later the organization was recast. In the interval the war had widened the scope of the undertaking and had given the Committee an opportunity of emancipating itself from the limited field of activity enclosed within the four walls of the *National Insurance Act*. Scientific information was required for the nation in the great emergency. For the first time in history the opposing armies relied on the chemist for the weapons of offence and on the medical scientist for the maintenance of healthy and physically efficient combatants. In these unforeseen circumstances the Medical Research Committee performed services of the utmost importance to the Empire. When the war was over, it became evident that it would be wasteful and inexpedient to narrow the sphere of the institution that had been adapted so admirably to meet an extraordinary demand. It was consequently taken over, lock, stock and barrel, by the Privy Council and subjected to a nominal control of a special committee of the Privy Council. For the year ended March 31, 1922, Parliament provided the sum of £130,000 to cover the whole cost of the work undertaken by the Medical Research Council. Very little information is given concerning the manner in which this sum of money has been spent. A balance sheet is not published, nor is there a list of persons receiving payment for whole-time or part-time service. The National Institute for Medical Research at Hampstead received £38,000 for salaries and expenses connected with research. A sum of £8,000 was provided for administration and travelling. The Industrial Fatigue Research Board costs £18,000 a year, but part of the expenses is defrayed by outside bodies. It is suggested that the great industrial firms should contribute to the expenses of this Board. In all the destiny of about £60,000 is revealed. It would therefore appear that about £70,000 is expended in supplementary grants, grants in aid and other forms of assistance to investigators working outside the immediate control of the Council.

The National Institute comprises six departments with twelve members of the full staff and ten attached members. The subjects of bacteriology, protistology and experimental pathology, biochemistry and pharmacology, applied physiology, applied optics and statistics are included. The library and publication department completes the equipment. In an appendix a list of 447 names is attached. At first sight the reader would assume that all these persons are employed directly or indirectly by the Medical Research Council. This, however, is not the case. The Medical Research Council apparently follows the policy of endeavouring to associate itself with all medical research in the United Kingdom. Grants are given to workers in various institutions, so that the Council may be able to coordinate the work with similar work proceeding elsewhere. Incidentally the publications of

these assisted workers are included among those of the Council. In a few instances the Council has induced certain visiting practitioners from foreign countries to join the department as voluntary workers.

There is much to be said in favour of one controlling and coordinating body for medical research in one country. Team work in research is an admirable method of expediting results. One problem can be attacked from several different and distinct aspects at the same time and the relative significance of facts brought to light can be more accurately assessed under such circumstances. In addition, it is a distinct advantage to have one recognized clearing house, since all institutions can be required to lend aid and to offer facilities for special study. When a private investigator is working detached from a powerful organization, he may have difficulty in gaining access to clinical or pathological material. The third advantage attaching to the single organization is that Parliament cannot evade its responsibility and must provide financial aid. Private or local research is too often handicapped by the fact that private endowment is not available and Governments cannot be expected to contribute. The plan adopted by the Privy Council is to allow the Medical Research Council to distribute the moneys provided by Parliament in a manner held to be advisable by men of undoubted standing in the world of investigators. The public is less likely to challenge the wisdom of this method of endowment of research than if public money were earmarked for a particular purpose. Every research worker knows only too well that it is impossible to guarantee any valuable results within a given time.

The disadvantages of the centralization of control and coordination of all medical research are very real. The control is in practice a personal one. A committee of eminent authorities is usually appointed, but such a committee is frequently dominated by one member with a strong personality. Much of the preparatory work of the committee must be conducted by the secretary or one member. The introduction of the personal element necessarily involves the exclusion of some workers who have not the confidence of the controlling faction and the manifestation of a predilection to a certain group of workers. In the United Kingdom, under the conditions obtaining with the Medical Research Council and the very numerous affiliated institutions this danger of preferential treatment is probably small. In a smaller community it would be impossible to eliminate it. In the next place, the plan involves a certain amount of driving. Scientific research should be unhampered by the impatience of the public. A committee responsible for a return for public money would have to insist on frequent publications. Instances can be given of premature publications and hurried investigations impeding rather than furthering progress in science. Many serious workers would refuse to work under a public committee for this reason. If medical research is subjected to a central control, the worker standing aloof would experience grave and perhaps insuperable difficulties in gaining a fair hearing. In the next place, the wholesale scheme, even when it is supported by what appears to be a large sum of money, as is the case with the Medical Research Council, tends to the perpetuation of amateur investigational work. A few whole-time positions with a living wage attached are created; the mass of workers receive pittances as grants in aid. These small honoraria are acceptable to young men intending to take up another line of practice after a year or two. But scientific research in medical problems, whether it be conducted in the clinic or in the laboratory, is of little value until the worker has been thoroughly trained. Men with an inquiring turn of mind are required for this class of work. They should equip themselves under the guidance of experienced investigators for a series of years and then devote their professional lives to the fascinating but extremely difficult work. The last objection to the control scheme is that it brings the research worker into the limelight. True scientists do not pander for applause and care little for public recognition. The discoverer of a reputed cure of cancer is usually a man with a commercial instinct; the pseudo-scientist, who allows himself to be interviewed by the newspaper reporter and whose portrait appears mysteriously without his consent, add nothing to knowledge. It is distasteful to a scientific worker to know that an interim report of his

work during the past twelve months will be published in the annual report of the central authority for everyone to read. This becomes worse when the daily papers print a garbled edition, mutilated by an unintelligent and half-educated member of the staff.

The Medical Research Council has given the world a large amount of valuable scientific information and a still large amount of indifferent material. Whether the output of the laboratories and clinics would have been less valuable or less voluminous without the parental control of the Council no man can say. One fact, however, must be accentuated. It has been instrumental in obtaining from Parliament £130,000 in one year for medical research.

A PACIFIC MEDICAL SERVICE.

IN a recent issue Dr. Philip A. Maplestone, some time Acting Director of the Australian Institute of Tropical Medicine at Townsville, took exception to the views expressed in this journal concerning the development of an extension of research work in tropical medicine in the Commonwealth. The arguments put forward with the view to preventing the expenditure of money for the purpose of the acquisition of knowledge concerning the disease prevalent in Australia scarcely call for any reply. Dr. Maplestone should be aware of the fact that the incidence of tropical disease in Northern Queensland is sufficiently high to provide anyone seeking an opportunity to investigate the numerous unsolved problems with ample opportunity for hard work for very many years. Filariasis alone deserves and even demands the attention of the serious and energetic investigator. Moreover, Dr. Maplestone ignores one important fact in his sweeping and destructive criticism. It is that each focus of tropical disease in Australia to-day may be the point from which future disaster may start and that it is far more economical to attack disease limited to a relatively small compass than to wait until it has got out of hand. The characters of disease vary widely in different countries and it is not justifiable to assume that what has been proved to be true of malaria, of anchylostomiasis, of filariasis, of dengue fever in other countries, applies in every particular to Australia. Malaria exists in North Queensland, but no one has yet discovered the mosquito that conveys the plasmodium.

While all diseases undergo some peculiar modifications when they occur in the tropics, the need for intensive research into the special ætiological and pathological problems of the north cannot be questioned. At the same time, it must be admitted that the call for research and profound study is even more urgent out in the Pacific than it is in the tropical areas of the Commonwealth. In New Guinea, in Samoa, in Fiji, in the countless islands to the east, there are races of natives approaching elimination. Civilization so-called has perhaps brought protection to the individual native, but it has been at the expense of the race. The West and the East cannot meet without disaster. The European may delight in the sport of his ethnological study; he may be convinced that he has a right to force his views on the reputed savage, whose ethical code, by the way, often stands on a plane not lower than his self-elected guardian. A moral obligation, however, attaches to the white man that he should not permit his intervention to bring physical damage to the sturdy, dusky lord of the isles. How many diseases has our vaunted civilization brought to the natives around our coasts? Is the native dying out because we are compelling him to adopt a social status and mode of life to which he cannot be habituated? In the interests of the native, who has a right to live in peace and happiness, we who have thrust ourselves into his life, must use our brains to study the medical aspects of the tropics in relation to the native. The problems are many and their solution is pressing. To follow the suggestion put forward of entrusting a Pacific medical service to the University of Sydney or to some private venture would be to court failure. It must be remembered that the University of Sydney had control of the Australian Institute of Tropical Medicine for several years and found this control so irksome that it begged the Federal Government to relieve it of the responsibility. Moreover, neither a university nor a private individual would be in a position to secure the international confidence necessary for an undertaking which must reach the territories of several distinct countries. The Federal Government has not yet developed its plans for

attacking the question of tropical diseases either in Australia or in the territories adjoining this vast continent. If one of the ventures in the past has not been crowned with success, this may in part be attributed to the fact that the right men have not always been found for the work. The Australian Institute of Tropical Medicine would be doomed to eternal failure if it were permanently staffed by men who claim that there is no work in tropical medicine to be done in the north. Dr. Breinl, Profesosr Priestley and Dr. Young have not given their skilled labours in vain and it is a calumny to imply that the institution was a failure under their regime. The Pacific Medical Service, if it is to serve its most important function, must be planned on a large scale, must be adequately equipped, must have the backing of the authorities who are responsible for the welfare of the natives and must be manned by energetic seekers after truth. The man who can find nothing worth learning in Australia, is useless for this task. Under such an organization as that suggested in our previous article, the service might yet restore to the native that of which he is being deprived. The international nature of the undertaking would suffice to protect the service from arbitrary and political restrictions which inevitably ruin scientific endeavour.

IMMUNITY REACTIONS OF DIPHTHERIA.

IT has been shown that diphtheria toxin acts on the tissues of the body by causing necrosis. The stages of this process in tissue cells may be demonstrated as passing through the phases of swelling, degeneration of the nucleus, dispersion of the chromatin, destruction of the envelope and finally the disappearance or disintegration of the cell. Schick assumed that a person who was immune to diphtheria, would be protected from the local action of toxin that might be introduced into the tissues. He found that this was so and in 1913 he devised the test that bears his name, as a means of differentiating persons who possess an active immunity to diphtheria from those who do not possess such an immunity. Schick's test is made by the injection into the layers of the skin of a small quantity of diphtheria toxin. This is followed by a skin reaction in the case of those who are not immune to diphtheria. If the person be immune, no reaction occurs, because the antitoxin in the blood fixes the toxin that has been injected. This has sometimes been regarded as a neutralization. It is more probable, however, that Ehrlich's view is the correct one, namely, that the antitoxin present in the blood acts as a receptor, to which the toxin becomes anchored, thus destroying its toxicity.

Dr. T. E. Dickinson[1] publishes a record of 1,200 tests made by the Schick method. The toxin used is a dilution of 1 in 500 in 0.7% saline solution containing 0.5% of phenol. It is standardized so that its minimum lethal dose is accurately known. The minimum lethal dose is that amount of toxin that in four days will kill a guinea-pig of 250 grammes weight. The dilution is such that 0.2 cubic centimetre contains exactly one-fiftieth of a minimum lethal dose and this is the amount used for injection. In his series of cases Dr. Dickinson had no instance of sepsis and no bad after-effects occurred. The inflammatory reaction is not always typical and a more transient form is sometimes manifested, a form in which the maximum reaction occurs earlier, in which fading begins earlier and in which the colouration and infiltraton are different. This is spoken of as a pseudo-reaction. In order to eliminate the pesudo-reaction, Dr. Dickinson used a control test in every case. If the toxin be heated to 75° C. for ten minutes the active toxin is destroyed, but not the protein which is in solution. Unheated toxin was injected into the skin of the right arm and heated toxin as a control into the skin of the left arm of the person to be tested. The right arm thus had an injection of toxin together with protein and the left arm one of protein only. In this way a pseudo-reaction could always be discovered and a true reaction or otherwise determined. Pseudo-reactions were ascribed by Schick to a hyper-sensibility on the part of the person tested to protein substances in the solution of toxin, rather than to the toxin itself. It may, however, be the expression of a partial immunity to diphtheria. It must be noted that diphtheria "carriers" do not react to the Schick test and the same holds true to the equally important "missed case."

Having thus the means of ascertaining who are immune and who are susceptible to diphtheria, it is necessary to determine whether a susceptible person can be rendered immune. In 1912 von Behring discovered that the endeavours to produce a passive immunity in human beings by injection of antitoxin were unreliable on account of the rapid dissociation of the antibody within the body. He also found that toxin mixed with antitoxin in certain proportions retained its immunizing propertes, though the immunity took much longer to develope. According to the teaching of Ehrlich, antitoxin is a reaction product of the cell cast off as a free receptor, which attaches itself to the toxin molecule. It is this toxin molecule anchored to antitoxin that von Behring discovered to be possessed of antigenic properties. Hence there must be a second point or receptor of the toxin which remains free and through which the toxin molecule can act as a stimulus to the cell. This may be summed up by saying that the toxin molecule possesses both a toxic property and a distinct antigenic property.

Dr. W. H. Park, of New York, has done a great deal of work with toxin-antitoxin immunization and has recently described his methods.[2] He used

[1] *The Lancet*, February 18, 1922.
[2] *Pennsylvania Medical Journal*, April, 1921.

four hundred lethal doses for a half-grown guinea-pig to which had been added just sufficient antitoxin to rob it of deleterious effects, *i.e.*, about four units of antitoxin. Three doses were given at intervals of one week. The mixture used for injection contained a certain amount of protein and there was generally a slight constitutional reaction. This occurred as a rule only after the first injection and was more marked in adults than in children. In regard to the duration of the immunity thus produced, Dr. Park showed that in 98% of those injected the immunity persisted for the whole period of his observations, namely, five years. In considering the practical value of the Schick test and the toxin-antitoxin immunization it must be remembered that the immensity of the task involved makes it very doubtful whether these procedures should be introduced on an extensive scale. The Schick test will be used chiefly during an outbreak of diphtheria to determine which individuals should be closely watched. Immunization with the toxin-antitoxin mixture should be used chiefly in outbreaks where the ordinary machinery used to control such epidemics is not effective or is incomplete. Where recurring epidemics appear in a given area or where an elusive focus of infection exists, it could also be effectively used. It has proved itself to be a practical method of protecting institutions, such as orphan asylums and similar restricted communities.

SYPHILITIC REINFECTION.

SINCE arseno-benzol has been introduced as the standard method of treatment of syphilis, the question of the possibility of a complete cure has been hotly disputed. Formerly cures were presumed after the exhibition of mercury, although the evidence on which the claims were made, was slender. It must be admitted that scientific evidence of complete cure is extremely difficult to adduce. The absence of all signs and symptoms of a syphilitic infection cannot be regarded as acceptable proof; it can be shown that the *Spirochæta pallida* may lie within the tissues hidden and latent for many years and in the end be stimulated into renewed activity. Even the absence of all lesions, determined by a searching *post mortem* examination, does not necessarily exclude the lurking of a family of spirochætes somewhere in the tissues. Serology has under ordinary circumstances little information to give concerning the completeness of a cure. It is conceivable that when the causal organism retreats for a spell and as a result the production of antibody is temporarily suspended, the serum may lose its antibody content which at one time indicated an infection. Moreover, the failure of a serum to fix complement in the Wassermann test is not to be regarded as definite evidence of the absence of the syphilitic antibody from the serum. In these circumstances those who sought for definite evidence of the power of salvarsan or its substitutes to destroy a syphilitic infection, relied on the occurrence of a new infection to prove the disappearance of the old infection. It must be admitted that in accepting this evidence, we have not adopted a strictly scientific attitude. Immunity as a rule survives an infection. It is well known that an attack of morbilli, scarlet fever, enteric fever and some other acute processes usually confers a complete protection to the individual against a future invasion. Second attacks and even third attacks of measles have been observed, but they are very rare. Nevertheless, it can be definitely established that the immunity conferred by a previous attack of these diseases endures for a considerable time. Clinical experience has shown that a person suffering from syphilis is immune to a second attack as long as the first infection persists. In the next place, the final disappearance of the clinical manifestations of the disease is often followed within a short time with the disappearance from the blood serum of the antibody on which the complement fixation reaction depends. There is therefore some justification for the assumption of the disappearance of the syphilitic immunity shortly after the death of all spirochætes within the body. Incidentally, it may be admitted that the immunity might disappear while living spirochætes are hiding in a latent condition.

Professor E. Finger has analysed this question in the light of his own experience and that of other observers.[1] He recalls the views promulgated over half a century ago by Fournier in regard to the recrudescent chancre, the pseudo-chancre and the recurrence of induration in a healed primary sore. Fournier admitted the theoretical possibility of a syphilitic reinfection, but maintained that he had not encountered a single instance of this occurrence. Professor Finger argues that it is impossible to be certain that a given sore occurring in a person who has previously had syphilis, is produced by a new infection merely on the discovery of spirochætes. The spirochætes might have been latent and have been attracted to an abrasion. Similarly, he cannot recognize in the reappearance of a serological reaction direct evidence of a fresh infection. The site of the chancre does not help in the distinction between a reinfection and a *chancre redux*. He examines every means whereby the differentiation could be made and regretfully arrives at the conclusion that this may be impossible. Under certain conditions reinfection can be definitely proved, but these are rare. They are that the patient is treated in the earliest stages and cured before the serum acquires the property of fixing complement in the presence of the Wassermann extract and a subsequent exposure is followed by a chancre, an indolent regional adenitis and a typical syphilitic secondary efflorescence. In all other cases, the fact of reinfection may be regarded as probable, but cannot be proved. The chances of a chancre being due to a fresh infection are greater if its site is at a distance from the site of the first sore. It is recognized that pseudo-chancres rarely occur on the lip or the tongue and consequently a sore in these situations in a person who has previously had a penile chancre, is probably the result of reinfection. In other words, Professor Finger presents arguments which must be accepted, that, while reinfection does occur, it is but rarely possible to determine whether it has taken place in a given individual.

[1] *Wiener Medizinische Wochenschrift*, No. 1, 1922.

Abstracts from Current Medical Literature.

PHYSIOLOGY.

Alveolar Carbon Dioxide in Relation to Meals.

PREVIOUS investigations have shown that changes in the alveolar carbon dioxide pressure follow the ingestion of a meal. E. C. DODDS AND T. I. BENNETT (*Journal of Physiology*, November, 1921) have further investigated the subject in relation particularly to the later stages of digestion. The introduction of a meal into the stomach is followed by an increase in the carbon dioxide pressure in the alveolar air which varies in degree directly with the amount of gastric hydrochloric acid secreted by the particular individual. Normal subjects of average type in regard to their gastric secretion give an alveolar CO_2 response of about four millimetres, those with marked hyper-secretion give an alveolar response sometimes as great as twelve millimetres, while those subjects, apparently normal in health, from whose stomachs hydrochloric acid can never be obtained, show no rise in pressure of alveolar CO_2 whatever. During the later stages of digestion there is a fall in the alveolar CO_2 pressure below that in the fasting condition and the conditions bringing about this fall have been particularly studied in this communication. The person on whom the investigations were to be made, swallowed a duodenal tube, Ryle's modification of Einhorn's tube being used. After an hour and a half or two hours, when it had been ascertained that the tip of the tube was in the duodenum by the withdrawal of a small quantity of alkaline, bile-stained fluid, various food substances or water were introduced into the duodenum. The results in every instance showed that the direct introduction of food substances into the duodenum leads to an immediate fall of alveolar CO_2 pressure, with a subsequent return to the fasting level, and that variations in the acidity of the substance introduced do not produce appreciable difference in the response. The immediate fall in the alveolar CO_2 pressure following the direct introduction of food substances into the duodenum must, the authors consider, be the consequence of the secretion of alkali into that portion of the alimentary canal, mainly the pancreatic secretion. This is borne out by the slight fall observed in a patient suffering from chronic disease of the pancreas whose fæces contained large quantities of unsplit fat and meat fibres. From the fact that the alveolar CO_2 response does not materially differ with substances of varying reaction and further that perfect health can be maintained in cases of complete achlorhydria, the authors argue that the formation of secretin by acid can only be regarded as an accessory and relatively unimportant factor in pancreatic secretion. Gastric lavage with a weak solution of atropine causes an arrest of continuous gastric secretion and an immediate fall of the fasting level of the alveolar CO_2 pressure. The respiratory centre allows changes of alveolar CO_2 pressure to occur and the resulting tendency is to maintain the reaction of the blood at a constant level.

The Colloidal Behaviour of Proteins.

PROTEINS show many peculiar properties which have been difficult to account for, *e.g.*, the depressing effect of neutral salts on the osmotic pressure, swelling and viscosity of certain proteins; the peculiar influence of the hydrogen ion concentration of the solution on these properties and finally the peculiar influence of the valency of the ion with which the protein is in combination and the apparent lack of influence of the other chemical properties of the ion except valency and sign of charge. JACQUES LOEB (*The Journal of General Physiology*, March 20, 1921) has investigated these peculiarities in great detail and in his paper he summarizes some of his results. He shows that the Donnan equilibrium explains most, if not all, of these properties. The Donnan equilibrium exists when a membrane separates two solutions, one of an electrolyte for the ions of which the membrane is permeable and one of an electrolyte for one ion of which the membrane is impermeable. It is immaterial whether the latter ion be a colloid or a crystalloid. When a collodion membrane separates a gelatine or albumin chloride solution of pH, say 3.3, from an aqueous solution of HCl of originally the same pH (but without gelatine), the pH is no longer the same on both sides of the membrane at the time of equilibrium, but is lower on the outside than in the gelatine solution, *i.e.*, the gelatine solution gives up acid to the outside solution. He has shown that the same thing applies to particles of gelatine suspended in acid solutions, the surface of contact of the gelatine and the aqueous solution acting here as a membrane. When a neutral salt is added to the outside solution the osmotic pressure and viscosity of the protein solution is diminished in proportion to the amount of neutral salt added. Loeb has shown that the difference in the pH concentration between the aqueous solution and the gelatine solution is diminished in strictly parallel manner. When certain other proteins, such as gelatine, are placed in acid solutions they swell, the degree of swelling being dependent on the concentration of the acid. It has been shown that this is an osmotic phenomenon. The addition of neutral salts diminishes this swelling just as it depresses the osmotic pressure and Loeb has shown that in this case too the depressing influence of the salts upon the swelling of gelatine is due to a diminution of the difference of pH inside and outside the gel. At the iso-electric point of gelatine and crystalline egg albumin the osmotic pressure is at a minimum and it rises when acid is added, at first with the increase of acid added reaching a maximum, when the pH is about 3.5', then on further addition of acid a rapid fall of osmotic pressure occurs. The difference in pH between the solution and the gel shows the same series of changes.

Pulse Pressure and the Output of the Heart.

THE pulse pressure is the difference between maximum and minimum pressure in the arterial pulse curve. Since the rise of pressure in the arteries at systole is due to the propulsion of a certain quantity of blood from the left ventricle into the aorta, the pulse pressure will tend to vary with the amount of blood put out at each beat of the ventricle. It has been suggested, therefore, that the pulse pressure might be taken as a measure of output and that the pulse pressure multiplied by the pulse rate, when multiplied by some constant factor which might vary from individual to individual, might be equal to the output per minute or the minute-volume of the heart. RUTH SKELTON (*Journal of Physiology*, November, 1921) has investigated this question on heart lung preparations of dogs. In such preparations the output of the left ventricle can readily be determined and it is possible to modify to any extent and independently either the amount of blood flowing into the heart and therefore the output of the heart, or the resistance which the blood has to encounter in leaving the arterial system and therewith the arterial pressure. Moreover, by altering the temperature of the blood flowing into the heart, the frequency of heart beat can be changed within wide limits. The results obtained show that the product of pulse pressure by pulse rate is of no value as a measure of heart output. In the experiments the relation between these two quantities varied between 6.5 to 1 and 47 to 1. A method of calculating output which can give such widely varying results is obviously of no use in clinical practice.

BIOLOGICAL CHEMISTRY.

Rickets and Light.

A. F. HESS, L. J. UNGER AND A. M. PAPPENHEIMER (*The Journal of Biological Chemistry*, January, 1922) have made some experiments on rats with the object of ascertaining the effect of sunlight on the development of rickets. It has been shown by Hess and Unger that infants can be cured from rickets by frequent short exposures to the sun. By this means and without any alteration in the diet the characteristic signs of the disorder diminish in three to four weeks, as noted by clinical examination and X-ray. A series of white rats has been put on a ration of patent flour, calcium lactate, sodium chloride and ferric citrate. On this ration rats invariably show lesions anatomically

identical with those of infantile rickets. One group of rats has been kept in the dark, while the other group has been taken into direct sunlight from fifteen to thirty minutes. After three weeks photographs have been taken by X-rays, while the animals have been killed after thirty to forty days. From four to five exposures a week have been given, according to the weather. For the first time in the authors' experience the "rhachitic dietary" has not led to the appearance of rickets. The rats showed no signs of rickets, either by X-ray examination or by histological study of the bones. The authors had previously shown that the introduction of secondary potassium phosphate into the ration in place of a certain amount of calcium lactate completely prevented the onset of rickets. The addition is equal to 75 milligrammes of phosphorus in 100 grammes of diet. A test was made to ascertain the counter-balancing effect of phosphate and darkness. It was found that the ration containing phosphate prevented the onset of rickets in the dark. Another ration containing an additional 25 milligrammes of phosphorus in 100 grammes of diet failed to prevent the occurrence of rickets in rats kept in the dark.

Diabetic Glucose.

H. FELSHER (*The Journal of Biological Chemistry*, January, 1922) has made estimations from day to day on the excretion of glucose by persons suffering from severe forms of diabetes. These measurements have been made during periods in which the amount of glucose excreted had been lessened by restrictions in the diet. The restriction in the diet has been continued until the patient has reached what is sometimes called the "sugar free" condition. When this state has been established for some days the diet has been increased. The estimations have been continued daily. All the results have been expressed as milligrammes of glucose per day. The records of the daily excretion show that the amounts of glucose excreted during the period of non-diabetic status have not been increased as the amount of carbo-hydrate in the diet has been augmented. As the glucose equivalent of the ration is increased, a position is reached at which the excretion of glucose is suddenly increased out of all proportion to the additional carbo-hydrate in the diet. Thus a young man, aged twenty-six years, excreted 520 milligrammes of glucose on a diet of 298 calories and 27 grammes glucose equivalent. The excretion remained closely similar, 680 milligrammes, when the diet had been increased in ten days to 1,336 calories with a glucose equivalent of 116 grammes, but the excretion rose to 2,700 milligrammes when the diet was raised to 1,404 calories with a glucose equivalent of 127 grammes. Charts are given of the observations upon seven patients whose diabetic histories are recorded. In every patient the increased diet was added step by step until a rapid acceleration of excretion was observed. The observation is in harmony with the conception of a limit of toleration for glucose in diabetes. An increased excretion of glucose developes with critical suddenness when this limit is over-stepped.

Uric Acid in Human Blood.

J. L. MORRIS AND A. G. MCLEOD (*The Journal of Biological Chemistry*, January, 1922) have described a new method for the estimation of uric acid and have described a series of observations upon the amount of uric acid in the blood of different persons. The new method is a colorimetric method, based on the total oxidation of uric acid. The uric acid is separated by percipitation with zinc chloride. Sodium cyanide is used to develope colour and arseno-18-tungstate replaces the phospho-tungstate used by other observers. Since the oxidation of the uric acid is complete, the method has decided advantages over earlier analagous processes. Estimations of uric acid in human blood have given irregular results. The irregularities have been explained as due to its slight solubility or to variations in oxidation. A third explanation has been mentioned, *viz.*, the presence of more than one form of uric acid in the blood. Gudzent showed that uric acid existed in lactam and lactim forms. It has been suggested that the uric acid present in the blood changes in form according to the effect of the blood on its property of keto-enol isomerism. Others have supposed that the uric acid was combined in different ways with other bodies in the blood. The authors have made numerous observations on the results of analysis of the same blood by different methods. The results show that, while different methods yield the same figure for uric acid in some specimens, quite different concentrations are obtained in other samples. The authors conclude from their study that more than one form of uric acid is present in the blood and that the irregularities with different modes of estimation or with the same method are caused by irregular precipitation of the different forms. They have determined the amount of the two forms in human blood, its serum and its corpuscular portion.

Digestion of Egg White.

M. S. ROSE AND G. MCLEOD (*The Journal of Biological Chemistry*, January, 1922) have made some observations on the digestion of raw egg white in human beings. While the behaviour of raw white of egg in the alimentary canal has been studied extensively, there has appeared little in the literature anent the digestibility of white of egg by human subjects. What has been done shows that native egg white offers some resistance to the speedy action of the digestive enzymes. Trypsin is stated to digest cooked egg white more rapidly than raw white of egg. The authors have made their experiments upon young women who took daily from ten to twelve whites of eggs as part of a simple mixed diet. The eggs were taken at first cooked during a three days' period and then raw for the same length of time. The diet was uniform during the experiment. It contained about 67 grammes of protein, of which 70% were derived from the eggs. Each experiment was made three times, the raw egg whites being well beaten in one series, being in their natural state in a second series and being half beaten and half untreated in the third series. Co-efficients of digestibility have been calculated in respect to the total protein in the diet. The fæces were separated into quantities corresponding to three days by administering carmine. Total nitrogen in the fæces was estimated in the usual way. The co-efficients of digestibility show that the raw egg white averages around 80%, while cooked egg white has a co-efficient of 86%. The lightly beaten egg white has a higher co-efficient than the unbeaten raw egg white. There is little practical difference between cooked egg white and well beaten raw egg white in the quantities usually added to the diet. The difference only becomes of importance when eggs are taken in quantities approaching the maximal in dietary practice.

Experimental Rickets.

E. V. MCCOLLUM, N. SIMMONDS, P. P. SHIPLEY AND E. A. PARK (*The Journal of Biological Chemistry*, January, 1922) have continued their investigation into experimental rickets with a view to determining whether it is the fat-soluble vitamin or some other substance which protects the skeleton when the calcium content of the diet is not favourable to the formation of normal bone. The authors present the results of a series of records of experiments on rats which have been fed throughout the period of growth and over a considerable part of their adult life on diets which are comparable except that some groups have received butter fat and other groups cod liver oil. The diets have been defective in the supply of calcium aside from any lack or sub-minimal provision of hypothetical bone-nourishing substance. The content in phosphorus was in every case not far from optimal. Under such conditions of lack of calcium the provision of a liberal amount of some substance associated with fats greatly improves the health of the animals. Young rats are, however, much better nourished by a diet containing 1% of cod liver oil than by a diet containing 10% to 20% of butter fat. Other experiments have shown that the addition of 3% of butter fat is ample for the supply of fat-soluble vitamin. The addition of seven times as much butter fat does not afford much protection to rats fed on rations in which the amount of calcium is one-fifteenth to one-fifth of that optimal. On the other hand, the addition of 1% of cod liver oil to the ration increases greatly the effectiveness of minute amounts of calcium in the ration. The authors conclude that cod liver oil contains in abundance some substance which is present in butter fat in only slight amount.

Special Abstract.

THE MEDICAL RESEARCH COUNCIL.

THE REPORT OF THE MEDICAL RESEARCH COUNCIL for the year ended September 30, 1921, may be regarded as an interim report of the work conducted under the direct or indirect auspices of the Council. The work comprises over one hundred pages. It is divided into chapters for convenience of classification.

Bacteriology.

In the National Institute for Medical Research at Hampstead, Dr. S. R. Douglas has completed a research into the serological reactions of the different types of *Vibrio choleræ* and *Vibriones paracholeræ A et B*. This work cannot be discussed in this place. His unfinished work on the nature of the protein contents of *Bacillus typhosus* and *Bacillus tuberculosis* is also mentioned in the report. Of particular importance is the investigation carried out by Dr. Douglas and Dr. Leonard Hill into the effects of ventilation and humidity of air heavily infected with bacteria. The brief report of this work is so clumsily worded that it is difficult to be quite certain concerning the findings of these investigators. Their paper will be published shortly. It appears that when bacteria are sprayed into the atmosphere, the bacteria are deposited more rapidly on cold surfaces than on warm ones in the presence of moisture. Efficient ventilation is said to accelerate the removal of bacteria from the atmosphere, especially when the air is saturated with moisture. Dry air blown over the surface of an agar plate on which bacteria are growing, removes fewer organisms than moist air; the number of organisms carried off is said to be increased if the air is laden with dust. In the absence of the evidence on which these statements are based, it is impossible to offer any comment; they would upset the usually accepted views on this subject.

Dr. Douglas and Dr. A. Fleming have conducted some interesting experiments a few years ago on the antigenic property of acetone extracts of bacteria. It is claimed that the substance extracted in this way can be preserved in a dry condition and that its power to act as an antigen is preserved indefinitely. The substance can be digested with trypsin or other proteolytic ferments. It is now announced that the products of the digested proteins are endowed with properties which may prove of practical importance. For example, attempts are being made to prepare an efficient protective serum by means of meningococci which have been extracted with acetone and the extract digested with ferments.

Dr. L. Colebrook, in the course of some observations on diphtheria antitoxin, has devised a method of measuring the strength of the antitoxin by means of the skin reaction. The possibility of an approximate standardization of diphtheria antitoxin is spoken of. Either the report is an unreliable document in regard to the exact nature of the investigations carried out by Dr. Colebrook, or this worker is endeavouring to replace a relatively exact method of standardization in common use by a biological phenomenon founded on many variable factors.

A highly suggestive piece of work is indicated in connexion with tetanus infection. Dr. W. E. Gye has found that infection cannot be produced by the bacillus of tetanus unless the defensive mechanism of the tissues is first broken down by some agent such as ionizable calcium salts or colloidal silica. Tetanus antitoxin is either impotent or of little value in the presence of calcium chloride or of silicic acid. Even a limited imagination would recognize the wide possibilities of the application of this fact, if it can be confirmed. Further work appears to have been conducted on silicosis. Dr. W. E. Gye and Dr. E. H. Kettle have demonstrated that both silicic acid and silica, when injected under the skin, produce a lesion which ends in the formation of fibroblasts. On this observation these workers have endeavoured to find an explanation of the pathogenesis of silicosis. The effect of silicates and colloidal silicic acid on the tissues has been studied in relation to their resistance to the tubercle bacillus. No indication is given in the report whether these observations have been followed out on bio-chemical and bio-physical lines, or whether they have been accepted without an elaborate study of the underlying mechanism. The publication of the details is awaited with keen interest.

Dr. Gye has followed up the work which was started some ten years ago, on the possible infective nature of disseminated sclerosis. He claims in a paper already published that this disease is definitely caused by a spirochæte, but the evidence on which he bases his claims is not strong enough to be convincing. The Council is extremely sanguine when it announces that a new outlook of hope is given that preventive or curative means for this disease may be found.

The highly important subject of the rate of growth of bacteria and the effect of bacterial concentration has been attacked by Dr. W. H. Tytler. He has found that the rate of growth is conditioned by the presence or absence of inhibitory or stimulating substances in the medium, while the bacterial concentration is determined by the actual concentration of food-stuffs. The rate of growth is slower in a medium with a concentrated nutrient content than in one with less abundant food-stuffs. The ratio of living bacteria to the nutrient constituents is an important factor in the growth of the former. Bacteria die out, not when the medium is exhausted, but when the number of bacteria in a given unit of medium exceeds a definite level. Close study of the biology of bacteria has already revealed many important facts concerning the puzzling anomalies of infections.

Protistology.

Some exceedingly surprising data have been revealed concerning the incidence of infection of the population of the British Isles with *Entamœba coli*. This fact has a grave hygienic significance. Again, it has been shown that between five and ten people out of every hundred who have not travelled beyond the shores of the British Isles, are infected with *Entamœba histolytica*. Notwithstanding this infection, relatively few people manifest any signs of amœbic dysentery. It is suggested that there must be some additional ætiological factor in amœbic dysentery other than the *Entamœba*.

Mr. Clifford Dobell and Dr. S. W. O'Connor have published a valuable book on the intestinal protozoa of man, in which all the known intestinal protozoa occurring in human beings are described. It will be remembered that Dr. O'Connor recently returned to London from the Gilbert and Ellice Islands and from Samoa, after having carried out come very careful and important investigations on filariasis occurring in the Pacific.

Bio-Chemistry.

In the course of some interesting work on the reaction of blood, Dr. C. A. Lovatt Evans demonstrated that when the reaction of blood or other fluid containing carbonates or carbon dioxide was estimated by the electrometric method, a catalytic reduction of carbonate to formate occurs at the point where the platinum electrode saturated with hydrogen comes in contact with the fluid. This necessarily yields a reading of the hydrogen-ion concentration which is a little too high. Dr. Evans has made some important observations on the hydrogen-ion concentration of blood under varying conditions and of varying types and has introduced methods of measurement of a high degree of reliability. The rôle played by bicarbonate and free carbon dioxide in variations of the reaction of the blood has been closely followed and some sound work has been carried out in relation to conditions of the circulation dependent on a reduction of the normal carbon dioxide content of the blood resulting from an excessive ventilation of the lungs. A more detailed account of Dr. Evans's work will be published at a later date.

Dr. H. H. Dale and Dr. C. H. Kellaway have some highly interesting things to say concerning anaphylaxis. We may expect soon to have a contribution which is calculated to upset the doctrines formulated by Friedberger on the hypothetical anaphylatoxins. The last word has not yet been written on this complicated subject and it would be unwise to anticipate that Drs. Dale and Kellaway have solved the many problems involved in this study.

Mention has been made concerning the work of Major H. W. Acton on the pharmacological action of the cinchona

alkaloids and more particularly on quinidine. The action of this drug in auricular fibrillation is of more than passing interest.

Dr. Harold King has disclosed a sulphur-containing impurity in all commercial arseno-benzol preparations. This discovery is of practical importance and demonstrates the undoubted advantages of research conducted independently of commercial firms. The whole world is now aware of one of the causes of the variability of the different preparations supposed to be identical with salvarsan. The possibility of the introduction of a biological test for the therapeutic efficacy of these preparations is foreshadowed.

Metabolism.

Dr. Leonard Hill has continued to apply the kata-thermometer in studying the living conditions of dwellings and work places. Formulæ have been constructed for the estimation of wind movements of under and over one metre per second. The understanding of the significance of air movement in relation to other meteorological factors has been considerably advanced by these researches. Whether the kata-thermometer can yield a reliable index of comfort or discomfort under tropical conditions remains to be proved. It would rather seem that the rate of cooling of the wet and dry kata-thermometer is not as accurate a reflection of the power of man to tolerate heat as is the registration of the dew point. Nevertheless, Dr. Hill's work continues to claim the attention of the scientific world. A highly important fact has been recorded by Dr. Leonard Hill and some of his assistants in regard to the effects of local heating and cooling of the body. Immersion of the hands into cold water causes the body to lose heat out of all proportion to the amount of heat given off to the water. It was also found that the body gains as much heat per minute as it loses under normal conditions when the hands are immersed in water at 44° C.. It is curious that the fact of the loss or gain of heat under these conditions is recorded in the report, but not the important observation that this phenomenon is governed by the heat regulating mechanism. The report is disappointing in the frequent occurrence of insufficient and unclear explanations of the work done.

Some important studies have been carried out on the metabolism in children under the influence of the sun's rays. Tissue change is generally accelerated while the children are undergoing heliotherapy. It would be of considerable importance if similar studies could be carried out in Australia, more particularly to ascertain whether the effect of the sun's rays on metabolism is subject to a definite law and whether an optimum effect can be obtained either in a particular district or by the adoption of measured dosage.

Statistical Studies.

Dr. John Brownlee is one of those uncanny individuals who is able to analyse epidemiological and other problems by means of extremely complex mathematical formulæ and to present deductions to the ordinary mortal which appear to be acceptable, but which the latter is incapable of controlling. Some of his work on the epidemiology of scarlet fever and of gastro-enteritis is of much value. Dr. Matthew Young has presented a statistical investigation concerning the geographical distribution of rheumatic fever. He has correlated the incidence of this disease with an excess in the amount of rainfall and a low mean annual temperature. He has also endeavoured to ascertain something concerning the incidence of cancer in its relation to physical features and geographical position. From the scanty details given, it would seem that the views recently published by Dr. Cherry would not be borne out.

Clinical Research.

A chapter is devoted to the investigational work conducted by the clinical units at some of the great metropolitan hospitals. The Council has established a department of clinical research at the University College Hospital. This department is working in association with the Cardiographic Department of the Hospital, under the direction of Sir Thomas Lewis. A considerable amount of original work has been published from the London hospitals to which the Council direct attention.

Biological Standards.

A special committee has been appointed under the chairmanship of Professor William Bulloch for the purpose of introducing biological standards and methods of biological assay and measurement. Reference to some of the work undertaken in this direction has been made under the captions of "Bacteriology" and "Bio-Chemistry." Standard cultures of bacteria and standard sera have been issued and some of these have found their way to Australia and New Zealand. The Governing Body of the Lister Institute of Preventive Medicine has arranged for the housing of the National Collection of Type Cultures. Dr. Ledingham is acting on behalf of the Council in controlling this valuable collection. Recently a special publication of the Council has been issued giving the complete catalogue of the collection. Several additions have been made during the year.

Army Medical Statistics.

It will be remembered that the Medical Research Committee undertook to collect, to collate and to classify the records of medical value received from the Army Medical Service. From a relatively large undertaking this task grew to stupendous dimensions. Various changes in form and method were introduced as the war progressed. After a few years the Ministry directed a very large number of inquiries to the Statistical Department concerning the information contained in the case sheets and cards. The material was transferred from premises to premises as its bulk increased. In March, 1921, it was subjected to its last move to Burton Court, Chelsea. The staff was augmented and a special effort was made to complete the work of classifying and sorting. The magnitude of the undertaking can perhaps be gauged from the fact that the cards alone weighed about 210 tons. During the year the work was completed and the Department has earned the recognition of the whole Army Medical Service and of the public for an astounding accomplishment.

Special Researches.

It is impossible to find space for a detailed summary of the various investigations undertaken by the special committees for the Medical Research Council. Over fifty pages of the report are devoted to this part of the scheme. Much of the work has been reviewed in these columns already. In the following some of the more important researches are selected for notice:

Tuberculosis.

There are three committees attacking problems connected with tuberculosis. The first is under the chairmanship of Dr. Leonard Hill and its function is to examine the incidence of pulmonary tuberculosis in its relation to occupation. Very little detail is given in the report concerning the work of this committee. The second committee, under the control of Dr. S. R. Douglas, deals with tuberculin. Apparently little success has attended the efforts of Dr. H. K. Ward to standardize various forms of tuberculous infection and to produce a standard tuberculin. It would further appear that some work has been carried out on the complement fixation with a tuberculous antigen, on the lines devised by Besredka. It is stated that this test embraces so many variable factors that it was relinquished for another technique not dependent on this principle.

In connexion with the application of chemo-therapy to tuberculosis, Professor C. H. Browning has made some interesting observations on what is known as chemotherapeutic interference. It has been shown in regard to trypanosomes that when a strain is rendered resistant to parafuchsin, the administration of parafuchsin interferes with the curative action of the acridin compounds. Apparently this principle is being applied to the action of acriflavin. Some interesting work is being conducted on these and similar lines by Professor J. B. Cohen at Leeds.

The third committee is inquiring into the many problems connected with the bacteriology of tuberculosis. This committee is under the chairmanship of Sir William Leishman. Dr. A. Stanley Griffith is devoting his whole time to the work and is contributing valuable information con-

cerning the characteristics of various types of tubercle bacilli. Dr. A. C. Inman, working for this committee, and Dr. A. L. Punch have taken up the study of the complement fixation tests in tuberculosis. A preliminary article on this investigation has been published in September, 1921. Professor Cummins, aided by Miss C. M. Acland, has been engaged in a research aiming at the determination of the "opsonin end-point." It is interesting to learn that the work is tending to results which do not coincide with the views of Sir Almroth Wright. It is claimed that specific chemical substances arise to aid the phagocytosis of the tubercle bacilli by the wandering cells, rather than by any process which renders the bacilli tasty (opsonized). The postulation of definite chemical substances in immunity is often a somewhat hazardous venture. So far these hypothetical substances prove merely to manifest themselves in some biological quality.

Streptococci and Pneumococci.

Dr. M. H. Gordon and Dr. G. K. Stone have continued their studies on the differentiation of the various races of pathogenic streptococci. Three main subdivisions have been described and their characters and serological peculiarities closely studied. The tendency of the pyogenic or hæmolytic group to spontaneous agglutination was overcome after much experimentation. Use was also made of complement fixation in the determination of the types or groups.

Professor I. Walker Hall, working with Dr. A. D. Fraser, had found that certain dilute acids accelerate the period of maximal growth of pneumococci, while other acids have the reverse effect. Other information of importance in regard to the lag period has been brought to light. Working at Cambridge, Dr. J. F. Gaskell has come to the conclusion that lobar pneumonia is invariably due to an infection through the respiratory tract and is never started through the blood stream. Hæmatogenous infections of the lungs are diffuse rather than localized and are usually distinguishable from lobar infections.

Problems of Child Life.

The determination of the maturity of infants by the condition of the centres of ossification, the investigation of the pathology of fatal conditions affecting the fœtus before birth and the relation between lesions of the placenta and the condition of the fœtus are subjects which have engaged the attention of Dr. A. M. Kennedy, of Glasgow. A very considerable amount of work in ante-natal and neo-natal pathology has been carried out by various workers. The information given in the report is extremely sketchy and does not permit of adequate summary. Much of the work, however, is incomplete. Important information should soon be available concerning the effect of social and industrial conditions on the mother and her unborn infant and concerning the true nature of so-called prematurity as a cause of infantile death. Investigations are being undertaken into the variations of a basal metabolism during menstruation and into the variations of the calcium content of the blood during this period and during pregnancy. It may be pointed out that, as far as we are aware, an exhaustive study of metabolism of the normal woman during pregnancy measured in a large respiration calorimeter has not been carried out in any part of the world. An endeavour was made to institute a research of this kind by Professor Hagemann a few years ago, but did not eventuate owing to the expense inevitably attached to such a study.

Accessory Food Factors.

Two committees have been appointed for the purpose of continuing the very valuable work initiated by Gowland Hopkins, McCarrison, Funk and others. The first committee under the leadership of Dr. Leonard Findlay had the function of dealing with the nature of rickets and its relation to possible deficiencies of accessory food factors. A considerable amount of work has been completed by Dr. Findlay, Professor Noël Paton and Mr. J. S. Sharpe. Their main conclusions were that there was no deficiency in calcium in the blood, muscle or brain of dogs suffering from rickets. The evidence available did not support the view that rickets was due to a deficient supply of calcium to the bones and that the percentage of calcium excreted in the fæces was more or less fixed for each individual. The work of Paton and Findlay on the pathogenesis of rickets has lead to a considerable amount of criticism. There is no doubt, however, that these workers have contributed materially to the sum of knowledge which is being accumulated concerning this disease. One of the most important and illuminating contributions to the subject is the monograph published by Professor Edward Mellanby on so-called experimental rickets. A full account of this work has appeared in THE MEDICAL JOURNAL OF AUSTRALIA.

Dr. S. S. Zilva, working with Professor A. Harden and Dr. Miuro, has continued to attack the bio-chemical problem of the fat-soluble food factor. Great interest attaches to the work carried out by Dr. Harriette Chick, Dr. Elsie Dalyell, Miss E. M. Hume, Dr. Helen Mackay and Miss H. Henderson Smith, who have been studying on behalf of the Lister Institute and of the Medical Research Council the manifestations of deficiency diseases among children in Vienna. Much information concerning hunger-osteomalacia has been revealed. This working sub-committee has received the utmost assistance from Professor von Pirquet, in whose clinic the greater part of the work has been undertaken.

Disorders of the Nervous System.

A special committee has been given the task of investigating mental disorders. The chairman is Dr. Henry Head and he is supported by several eminent neurologists, psychiatrists and pathologists. This work was previously entrusted to the Board of Control (formerly the Lunacy Commissioners), but the annual subsidy for research purposes was withdrawn early in 1921 and the Medical Research Council was required to continue the investigations. Dr. J. F. E. Prideaux has already published his work on the relation of the psycho-neuroses to mental deficiency and the expression of emotion in cases of mental disorder. In the latter work he utilized the psycho-galvanic reflex and established some important facts. Sir Frederick Mott has continued to probe into the secrets of the pathology of certain diseases of the mind. His views have been presented in the Morison Lecture for the year 1921, on the psycho-pathology of puberty and adolescence. Mention is made of the fact that he found a regressive atrophy of the testes and ovaries in *dementia præcox*, but not in *dementia paralytica*. Much work has been conducted in connexion with the effect of shock and of functional war neuroses on the mind and brain. It is stated that Dr. F. M. R. Walshe is engaged on a research in Professor Sherrington's laboratory on the function of the cerebellum.

Industrial Hygiene.

Reference has already been made to the activity of the Industrial Fatigue Research Board. The terms of reference to the Board on its reconstruction were as follows:

"To suggest problems for investigation and to advise upon schemes of research referred to them from time to time by the Medical Research Council, undertaken to promote better knowledge of the relations of hours of labour and of other conditions of employment, including methods of work, to functions of the human body, having regard both to the preservation of health among the workers and to industrial efficiency and to advise the Council upon the best means for securing the fullest application of the results of this research work to the needs of industry."

A separate annual report of the Board is being issued.

Further Investigations.

Among other subjects investigated are dust inhalation and pulmonary diseases, miners' nystagmus, anchylostomiasis in Cornish mines, the physiology of muscular work and the hygiene of special industries. It would appear that some important information will be published by Professor R. T. Leiper on the incidence of hookworm infection in the tin mines of Cornwall.

Many other chapters of research are accorded more or less brief review in the report. It is obvious that no conclusions can be drawn from the amount of detail given concerning the importance of this work. It is unfortunate that those responsible for the compilation of the report have not rendered the accounts with uniformity and have not always delivered their message with sufficient clearness.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Queensland Branch of the British Medical Association was held at the B.M.A. Building, Adelaide Street, Brisbane, on March 3, 1922, DR. G. P. DIXON, C.B.E., the President, in the chair.

Toxic Amblyopia.

DR. ALEX. J. MACDONALD presented a man, aged seventy-two years, who was suffering from tobacco amblyopia. The patient had first consulted Dr. MacDonald on October 5, 1921. His vision had been failing for nearly three years. The failure of vision had begun in the right and had soon extended to the left eye. The patient had smoked four ounces of tobacco per week for thirty or forty years. Two years before consulting Dr. MacDonald he had thought that he had been smoking too much and had reduced the amount of tobacco to one and a half ounces a week. Nyctalopia had been present. Examination had shown that vision in the right eye was restricted to the perception of hand movements. Vision in the left eye had been $^1/_{60}$. There had been a scotoma for red and green in the left eye which had gradually deepened and had become absolute in the centre. The cornea, lens and media had been clear. There had been a small hæmorrhage in the right macula obscuring the disc, while the left disc had been atrophic and pale on the temporal side. Tension in both eyes had been normal. Vision had not been improved by glasses. Dr. MacDonald had advised the patient to stop smoking immediately. This the patient had done. He had also been taking small doses of *liquor strychninæ* twice daily and the vision in the left eye had improved from $^1/_{60}$ to $^4/_{60}$. After he had stopped smoking, the patient's general health had improved; he had a better appetite in the mornings and could see well enough to go out by himself. The hæmorrhage in the right macular area had cleared up and a pale, atrophic disc could be seen. Vision had not improved, however, as the retina was atrophied and transformed into connective tissue, except in small portions of the periphery of the field of vision.

DR. J. LOCKHART GIBSON said that if the macula in the left eye was healthy, the case was probably one of extreme tobacco amblyopia. It was his opinion that, unless tobacco were completely stopped, the effect of excessive doses in the past would be maintained. The prognosis should be guarded. In treating this condition he gave no drugs, such as strychnine, as, in the event of recovery, the patient generally considered that the cure was due to the drugs and began smoking again, with a recurrence of all his symptoms. The blindness might be due to the ganglion cells of the retina, but he was of the opinion that in many instances the optic nerve might have been injured.

Ectopia Vesicæ.

DR. A. S. ROE presented a girl, aged three and a half years, who was suffering from complete *ectopia vesicæ*. Dr. Roe had transplanted both ureters into the pelvic colon. The right ureter had been first transplanted; the wound had broken down on the tenth day. There had been an associated peritonitis of low virulence. When the left ureter was transplanted at a later date, there had been a slight infection of the wound, owing to the low resistance of the child. The child at the present time could hold urine for three or four hours and there was no ulceration round the vagina or anus.

DR. E. S. MEYERS congratulated Dr. Roe on the good result of his operation and asked for particulars of the mode of insertion of the ureter into the bowel.

DR. G. P. DIXON, C.B.E., asked Dr. Roe for the latest statistics of the end results of this operation. He had seen Stiles operating and the latter had told him that many of the patients developed ascending pyelitis with fatal results.

DR. A. S. ROE, in reply, stated that he had followed Coffey's method. He had operated on the right side first, because of the difficulty of getting a good anastomosis if the left were done first. Portion of the lower end of the ureter, 7.5 centimetres in length, had been freed and inserted into the bowel as low as possible in order to lessen the amount of absorption. These patients were apt to become uræmic during convalescence and it was necessary to catheterize them freely during the first few days. He thought that this patient had a mild infection of both kidneys at the present time. There was a mild acidosis at present and the child was being fed on citrated milk.

Hyperpyrexia After Abortion.

DR. A. H. MARKS showed the chart of a patient with hyperpyrexia after abortion. The patient had been admitted to hospital with a threatened abortion and a temperature of 39.4° C.. She had had three rigors, with temperatures varying from 40.5° C. to 42.1° C.. The uterus had been emptied and the temperature had fallen to normal. The discharge had not been fœtid, nor had there been any history of interference.

Alkaptonuria.

DR. A. GRAHAM BUTLER, D.S.O., presented a young man who was extremely thin and who had been treated at various times for gastric ulcer, diabetes and debility. The urine had a specific gravity of 1,022; no albumin was present; there had been a marked reduction of Fehling's solution. On allowing the urine to stand over night, it had been noticed to be much darker and had given the ferric chloride reaction for alkaptonuria. This condition was purely a physiological one and had nothing to do with his marked wasting.

DR. A. S. ROE said that he had seen the same patient some time before. At that time he had had fever associated with a cough and definite signs of tuberculosis. In examining the urine he had noticed a strong reduction of Fehling's solution, but had missed the alkaptonuria. He had treated the patient on a modified Allen's diet. The man had improved for a time, but Dr. Roe had subsequently lost sight of him.

DR. G. P. DIXON, C.B.E., said that he had examined the same young man and had been puzzled by the low specific gravity of the urine, together with the reduction of Fehling's solution. He too had missed the alkaptonuria. He had suspected that the patient was suffering from tuberculosis, but no tubercle bacilli had been found in the sputum.

Uterine Prolapse.

DR. C. A. THELANDER read a paper entitled "The Importance of the Utero-Sacral Ligaments in Uterine Prolapse" (see page 511).

DR. D. A. CAMERON said that he was not convinced by Dr. Thelander's result. Many of the patients had been nulliparæ. Statistics showed that 20% to 25% of virgins had retroversion not associated with any symptoms. When prolapse commenced, symptoms occurred and shortening of the utero-sacral ligaments would do good. Dr. Cameron said that he would like to know what the symptoms had been for which operation had been performed in these patients and whether any other methods of treatment had been applied. He strongly advocated the regular use of a knee-chest position and of treatment for the improvement of the general health before considering the performance of an operation. He thought that postural treatment and tonics would cure the majority of patients. He was strongly opposed to the use of the pessary. The shortening of the utero-sacral ligaments would bring the cervix back, but it would not ante-vert the body of the uterus and so restore it into the normal position. In multiparæ simple shortening of the ligaments was not sufficient, but must be associated with a thorough repair of the pelvic floor.

DR. A. H. MARKS said that he agreed with Dr. Thelander that many patients with retroversion who showed no symptoms, did not require operation. He thought that Gilliam's operation was very satisfactory for nulliparæ. In the average case of prolapse he found extensive vaginal repair most satisfactory.

DR. T. H. R. MATHEWSON referred to the undesirability of local treatment in single girls. He thought that such

measures frequently resulted in neuroses which necessitated subsequent psycho-analytical treatment.

DR. J. A. CAMERON asked Dr. Thelander what conditions he included under the term prolapse. Dr. Thelander seemed to include retroversion with prolapse. He (Dr. Cameron) thought that retroversion was not necessarily the first stage of prolapse. Most patients with retroversion had backache, dysmenorrhœa, leucorrhœa and debility. For these patients he favoured the Gilliam operation associated with vaginal repair.

DR. R. MARSHALL ALLAN, M.C., was surprised that Dr. Thelander had not referred to the work of Donald and Fothergill at the first British Congress of Obstetrics and Gynæcology held in 1921. These authorities had claimed that abdominal operations were unnecessary in the treatment of prolapse. He was also surprised to note from the reports of Dr. Thelander's cases that very little vaginal repair work had apparently been done. Prolapse of the uterus was usually associated with an hypertrophied cervix and perineal laceration. The shortening of utero-sacral ligaments alone would not make a permanent cure. He was thoroughly in accord with Dr. Thelander in regard to the importance of these structures, but he did not consider that Dr. Thelander's abdominal operation showed any advantage over vaginal shortening by Jellett's method. He thought that for nulliparæ amputation of the cervix, if necessary, combined with a round ligament operation, was all that was required. In multiparæ before the menopause, radical vaginal repair associated with shortening of the utero-sacral ligaments was usually sufficient. If necessary, this could be combined with a Gilliam's operation. After the menopause marked prolapse was best treated by the interposition operation associated with colpo-perineorrhaphy. He was in agreement with some of the previous speakers regarding the use of the pessary for patients suffering from sub-involution and retroversion after parturition. This would frequently obviate future operations.

DR. G. P. DIXON stated that the utero-sacral ligaments must be stretched before a prolapse could commence. He denied that the round ligaments had anything to do with the support of the uterus. The great causes of prolapse were puerperal sub-involution associated with a damaged pelvic floor. If the utero-sacral ligaments alone were repaired, they would be liable to stretch again after a future pregnancy, unless further repair had been done in the first place.

DR. A. C. F. HALFORD stated that in *The British Medical Journal* of June 18, 1921, there was a report of the proceedings of the first British Congress of Obstetrics and Gynæcology. Dr. W. E. Fothergill and Dr. F. H. Lacey, of Manchester, had opened a discussion on "Genital Prolapse." The title of their paper had been: "The End Results of Plastic Vaginal Operations for Genital Prolapse." Dr. Halford regarded this communication and the discussion which followed as one of the most illuminating he had read or listened to. The subject of genital prolapse had until recent years been sadly lacking in standardized methods of treatment and he thought that in the communication referred to there was laid down a simplified and ordered technique that was well within the scope of surgeons of limited experience. By the exclusion of abdominal section, the operations described were eminently safe, were founded on sound anatomical principles and gave results more successful and more uniform than any hitherto published. For six months during 1913-1914 Dr. Halford had searched the schools and hospitals in America for some guiding principle with evidence of unanimity of support that was so essential for lesser lights to follow. He had sought in vain. Every surgeon had had a different method and the complexity and fantastic nature of some of them had been appalling. In 1915 he had been fortunate enough to become acquainted with the method of dealing with genital prolapse that may be described as a fusion of the work of Edinburgh and Manchester gynæcologists. This fusion of methods had been described in an article in *The British Medical Journal* entitled "Gynæcology in War Time," or words to that effect. Dr. Halford had adopted this method in his work since that time and he felt deeply indebted to the authors for devising an operation so satisfying in results so far achieved and so much after his own inclination by the avoidance of unnecessary invasion of the peritoneal cavity. He counted this a great gain. It was this feature of Alexander's operation that had appealed to him, so that, as an adjunct to what he might call the Donald-Fothergill method, there was no violation of the law these gynæcologists had enunciated at the Congress referred to that "abdominal intervention was unnecessary and undesirable." These authorities had especially "deprecated the use of abdominal measures, not in addition to, but instead of vaginal surgery."

DR. THELANDER, in reply, thanked the President and members for their reception of his paper. It had not been his intention to discredit other operative methods, nor to suggest that obvious defects need not be repaired. For this reason the operation of utero-sacral suspension was more often applicable to nulliparæ in whom the symptoms were severe enough to warrant operation and especially when they seemed attributable to displacement of the lower portion of the uterus. Posture treatment had been mentioned but not included in the scope of the paper. It had to be remembered, however, in relation to Dr. D. A. Cameron's recommendation of posture treatment for retroversion, that prolapse very frequently began without retroversion. The weight of the uterus was of little consequence, even in cases of enlargement. It was the intra-abdominal pressure that was important. Fothergill had been quoted as claiming to cure prolapse by repair of the perineum; but this was surely a misrepresentation, for prolapse occurred in spite of a normal perineum. As a matter of fact, Fothergill secured suspension of the uterus by the same structures, but preferred the vaginal method of approach. The Hodge pessary should not be condemned before one had learned how to use it and especially to mould it to whatever shape was most suitable. It had been objected that the results did not seem conclusive. This had to be admitted in some degree. In the cases reported as satisfactory, the position of the uterus had been such that the suspension of the utero-sacral ligaments had certainly been maintained. The resultant position from a Gilliam operation was very different. Nevertheless, it was unwise to subject the patient to the risk attendant on utero-sacral suspension without some supplementary procedure.

MEDICO-POLITICAL.

A MEETING of the Queensland Branch of the British Medical Association was held at the B.M.A. Building, Adelaide Street, Brisbane, on March 3, 1922, DR. G. P. DIXON, C.B.E., the President in the chair.

Fees for Anæsthetics.

THE HONORARY SECRETARY stated that a member had requested a ruling from the Council in regard to the responsibility for anæsthetic fees. The Council had recorded the following opinion:

> That when a surgeon or accoucheur calls or requests any medical man to administer an anæsthetic, the surgeon or accoucheur concerned is responsible for the payment of the fee to the anæsthetist, even though the patient may fail to fulfil his financial obligations. If the patient makes his own arrangements with the anæsthetist, this absolves the surgeon from responsibility of the fee to the anæsthetist.

NOMINATIONS AND ELECTIONS.

THE undermentioned have been nominated for election as members of the New South Wales Branch of the British Medical Association:

BRADLEY, GILBERT GEORGE, M.B., Ch.M., 1922 (Univ. Sydney), "Manfield," Johnson Street, Chatswood.

MADDEN, JOHN PATRICK CAWLEY, M.B., Ch.M., 1922 (Univ. Sydney), Sydney Hospital.

PARK, ALEXANDER NORMAN, M.B., Ch.M., 1922 (Univ. Sydney), 3, Beaufort Street, Croydon.

VERBRUGGHEN, ADRIEN HENRI PIERRE EUGENE, M.B., Ch.M., 1922 (Univ. Sydney), Guyra.

WINSTON, CHARLES EDWARD, M.B., Ch.M., 1922 (Univ. Sydney), Sydney Hospital.

NOTICES.

THE COUNCIL OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION has arranged the following provisional programme of the Branch. The Scientific Committee reserves to itself the right to modify the arrangements, but it is hoped that no changes will be necessary.

May 23, 1922.

At the Walter and Eliza Hall Institute, Melbourne Hospital, at 8.15 p.m., in conjunction with the Australian College of Dentistry Alumni Society.

DR. W. S. WILKINSON: "The Development of the Human Dental Mechanism." "The Significance of the Deciduous Teeth." "Orthodontia as an Aid to Pædiatrics."

DR. J. K. CLARK: "Oral Sepsis."

DR. J. M. LEWIS: "Cooperation Between the Medical and the Dental Professions."

June 7, 1922.

At the Walter and Eliza Hall Institute, Melbourne Hospital, at 8.15 p.m..

DR. W. J. PENFOLD will demonstrate the action of pneumococci on aromatic amino bodies.

DR. W. J. PENFOLD: "Australian Pneumococci."

DR. S. W. PATTERSON: (*a*) "Prognosis in Pneumonia"; (*b*) "Clinical Application of Serum Treatment of Pneumonia."

DR. R. L. FORSYTH will open the discussion on the serum treatment of pneumonia from clinical experience at the Children's Hospital. Papers will be illustrated by lantern slides.

July 5, 1922.

At the Alfred Hospital.

A CLINICAL MEETING will be held, of which the details will be announced later.

University Intelligence.

POST-GRADUATE COURSE IN MELBOURNE.

THE MELBOURNE PERMANENT COMMITTEE FOR POST-GRADUATE WORK announces a series of lectures for June and July, 1922. The lectures will be delivered at the Walter and Eliza Hall Institute of Research in Pathology and Medicine, Melbourne Hospital, on Tuesday evening in each week at 8.15 p.m.. The subject matter will be considered mainly from the clinical aspect and each lecture will be complete in itself and will be illustrated by lantern slides.

The fee for the course is one guinea. Entries may be sent to DR. S. W. PATTERSON, Director of the Walter and Eliza Hall Institute, Melbourne Hospital, or to DR. J. H. ANDERSON, University of Melbourne, from whom full particulars may be obtained. The syllabus is as follows:

First Lecture, June 6, 1922.

DR. J. H. ANDERSON: (*a*) "The Development of the Nervous System in Man from the Standpoint of Comparative Anatomy." (*b*) "The Anatomy of the Autonomic Nervous System."

Second Lecture, June 13, 1922.

DR. R. R. STAWELL: "Neurological Conditions Associated with Lesions of the Thalamus and Striate Nuclei and Mid-Brain Area, such as Thalamic Syndrome, Lenticular Degeneration, *Paralysis Agitans* and Choreiform Movements."

Third Lecture, June 20, 1922.

DR. R. R. STAWELL: "Neurological Conditions Associated with Lesions of the Cerebral Cortex, Sub-Cortical Area and Internal Capsule, such as Hemiplegia and Aphasia."

Fourth Lecture, June 27, 1922.

DR. FRANK ANDREW: "Clinical Disorders of the Static Labyrinth and Cerebellum."

Fifth Lecture, July 4, 1922.

DR. R. R. STAWELL: "Neurological Conditions Associated with Lesions of the Spinal Cord, such as Paraplegia in Extension, Paraplegia in Flexion, with Special Reference to Neurological Disturbances of the Bladder."

Sixth Lecture, July 11, 1922.

DR. R. R. STAWELL: "Manifestations of Syphilis Affecting the Nervous System, with Reference to Methods of Investigation and Treatment."

Seventh Lecture, July 18, 1922.

DR. R. R. STAWELL: "Tumours of the Brain: Epilepsy."

DR. H. R. DEW will demonstrate a series of specimens of brain tumours.

Eighth Lecture, July 25, 1922.

DR. R. R. STAWELL: "Certain Aspects of Pain of Visceral Origin: Clinical Manifestations of Disturbances of the Autonomic Nervous System."

THE UNIVERSITY OF SYDNEY.

AT a meeting of the Senate of the University of Sydney held on May 1, 1922, the Vice-Chancellor reported that he had conferred medical degrees on fifty-nine candidates; degrees were conferred *in absentia* upon a number who, being in the country or adjacent States, were unable to be present at the conferring.

Correspondence.

RESEARCH IN TROPICAL AUSTRALIA.

SIR: The letter written to THE MEDICAL JOURNAL OF AUSTRALIA of April 29, 1922, by Dr. Maplestone regarding laboratory work in tropical diseases, raises issues important enough to justify a reply.

In so far as the history of the Australian Institute of Tropical Medicine is concerned, many things might be said in effective reply to Dr. Maplestone, but controversial justification of past events is unprofitable and, in the present instance, could serve no useful purpose.

The future policy of this Laboratory is well defined. Preliminary arrangements are well advanced and it is expected that in about two months' time it will be possible to make a statement which will convince those interested that the equipment and facilities at the Tropical Institute will be used to the best advantage in furthering the development of tropical Australia.

As for the territories, an experienced officer of this Department has been stationed at Rabaul in charge of a laboratory there for six months; an entomologist is now on his way to New Guinea to make a mosquito survey of both New Guinea and Papua; and it is expected that a branch laboratory will also be obtained at Papua during this year.

Yours, etc.,

J. H. L. CUMPSTON,
Director-General of Health.

Department of Health, 51, Spring Street,
Melbourne, May 4, 1922.

COUNTRY HOSPITALS.

SIR: I was pleased to read your article on country hospitals. I live in a town and district in South Australia—one of the wealthiest in the State—of approximately 4,000

people. This town has only one hospital. I came here in 1910 and believed the hospital was a Government-assisted private hospital. Both doctors in the town used the hospital for private patients, apparently as a recognized right of patient and doctor.

In 1917 the Hospital Board objected to this practice in writing to the Government, who appointed a Board of Inquiry, who found that the doctors and their patients had no legal right to use the institution thus and that the hospital was a Government charitable hospital by the *Hospital Act* of 1877. Yet the other doctor and his patients were allowed to continue this practice and have done so ever since. I was offered a purely honorary appointment in the institution, which, under the circumstances, I refused.

On September 15, 1922, the hospital was proclaimed a subsidized hospital and now apparently can be legally used as a private hospital. It is not usual in British countries for an Act of Parliament to be held in abeyance for five years to suit private interests and I hope THE MEDICAL JOURNAL OF AUSTRALIA will be able to alter a state of things that makes it difficult for a doctor to adequately attend to his patient under circumstances calling for hospital attention.

Yours, etc.,

THOMAS B. ASHTON.

Kooringa, South Australia,
April 18, 1922.

THE TRANSMISSION OF TAPEWORMS TO MAN.

SIR: A patient of mine has a dog suffering from tapeworms and an excess quantity of fleas. A "vet." has proclaimed to my patient that: "It is now a well-known fact that fleas are carriers for tapeworms." I cannot find any support to such a statement in any of my books. Would you be kind enough to inform me if such is the case and where I can find the authority for such statements?

Yours, etc.,

"EL MEDICO."

[The transmission of the cestodes spoken of as tapeworms from the host harbouring the *scolices* to man is invariably by direct ingestion. We know of no evidence that has been published of a flea or other insect acting as a vector of either *scolices* or ova of tapeworms.—EDITOR.]

Books Received.

PROCEEDINGS OF THE UNIVERSITY OF OTAGO MEDICAL SCHOOL, 1922, edited at Dunedin, New Zealand, by D. W. Carmalt Jones, M.D., F.R.C.P. Wellington, New Zealand: The Wellington Publishing Company, Limited.

Medical Appointments.

DR. E. P. THURSTAN (B.M.A.) has been appointed District Medical Officer and Public Vaccinator at Sharks Bay, Western Australia.

* * * *

DR. E. S. G. K. VANCE (B.M.A.) has been appointed Public Vaccinator at Violet Town, Victoria.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xviii.

UNIVERSITY OF MELBOURNE: John Grice Cancer Research Scholarship; also Stewart Lecturer and Demonstrator in Pathology.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, 429, Strand, London, W.C.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney	Australian Natives' Association Ashfield and District Friendly Societies' Dispensary Balmain United Friendly Societies' Dispensary Friendly Society Lodges at Casino Leichhardt and Petersham Dispensary Manchester Unity Oddfellows' Medical Institute, Elizabeth Street, Sydney Marrickville United Friendly Societies' Dispensary North Sydney United Friendly Societies People's Prudential Benefit Society Phœnix Mutual Provident Society
VICTORIA: Honorary Secretary, Medical Society Hall, East Melbourne	All Institutes or Medical Dispensaries Australian Prudential Association Proprietary, Limited Manchester Unity Independent Order of Oddfellows Mutual National Provident Club National Provident Association
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane	Brisbane United Friendly Society Institute Hampden District Hospital, Kuridala, North Queensland Stannary Hills Hospital
SOUTH AUSTRALIA: Honorary Secretary, 3, North Terrace, Adelaide	Contract Practice Appointments at Renmark Contract Practice Appointments in South Australia
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Diary for the Month.

MAY 15.—Illawarra Suburbs Medical Association, New South Wales.
MAY 16.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
MAY 17.—Western Australian Branch, B.M.A.: Branch.
MAY 23.—New South Wales Branch, B.M.A.: Medical Politics Committee; Organization and Science Committee.
MAY 24.—Victorian Branch, B.M.A.: Council.
MAY 25.—South Australian Branch, B.M.A.: Branch.
MAY 25.—Brisbane Hospital for Sick Children: Clinical Meeting.
MAY 26.—New South Wales Branch, B.M.A.: Branch.
MAY 26.—Queensland Branch, B.M.A.: Council.
JUNE 2.—Queensland Branch, B.M.A.: Branch.
JUNE 7.—Victorian Branch, B.M.A.: Branch.
JUNE 9.—New South Wales Branch, B.M.A.: Clinical Meeting.
JUNE 9.—Queensland Branch, B.M.A.: Council.
JUNE 9.—South Australian Branch, B.M.A.: Council.

Editorial Notices.

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